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National Technical Information Service

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Demonstration Model Personnel Management Information System

Sperry Univac, Washington, D C

Prepared for

Environmental Protection Agency, Research Triangle Park, N C

Oct 77

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This documentation represents the culmination of an effort begun in April of 1977 to install a prototype information management system at EPA's National Computer Center located at Research Triangle Park, North Carolina. This project successfully demonstrated the stability and capabilities inherent in SPERRY UNIVAC DMS 1100 and QLP 1100 software.

Much of the documentation came from notes in the USE Technical Papers, papers prepared by the Sperry Univac Roseville Development Center, and from various other reports and papers on DMS 1100 or database management systems, in general.

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ENVIRONMENTAL PROTECTION AGENCY

NATIONAL COMPUTER CENTER

RESEACH TRIANGLE PARK
NORTH CAROLINA

DEMONSTRATION MODEL PERSONNEL MANAGEMENT INFORMATION SYSTEM

OCTOBER 1977

PREPARED BY
SPERRY UNIVAC
COMPUTER SYSTEMS

The following documentation represents the culmination of an effort begun in April of 1977 to install a prototype information management system at EPA's National Computer Center located at Research Triangle Park, North Carolina. This project successfully demonstrated the stability and capabilities inherent in SPERRY UNIVAC DMS 1100 and QLP 1100 software.

Much of the documentation came from notes in the USE Technical Papers, papers prepared by the Sperry Univac Roseville Development Center and from various other reports and papers on DMS 1100 or database management systems, in general.

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I.

IMPLEMENTATION PLAN

PERSONNEL MANAGEMENT INFORMATION SYSTEM

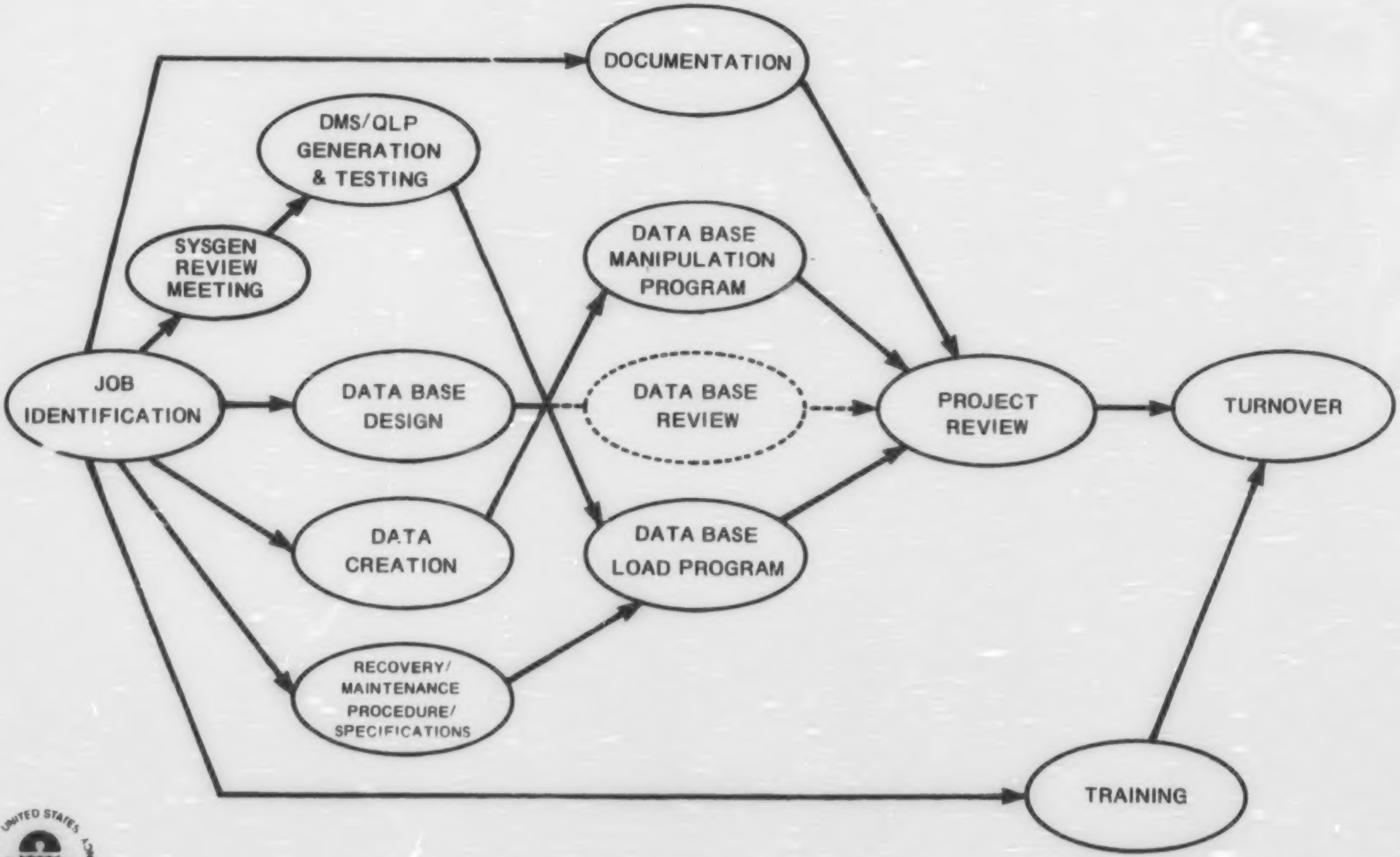
DEMONSTRATION MODEL PROJECT USING DMS 1100

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SPERRY UNIVAC
COMPUTER SYSTEMS

PERSONNEL MANAGEMENT INFORMATION SYSTEM

DEMONSTRATION MODEL PROJECT USING DMS 1100



JOB IDENTIFICATION

SYSGEN REVIEW MEETING

DMS/QLP GENERATION & TESTING

DOCUMENTATION

DATA BASE DESIGN

DATA CREATION

RECOVERY/ MAINTENANCE PROCEDURE/ SPECIFICATIONS

DATA BASE MANIPULATION PROGRAM

DATA BASE REVIEW

DATA BASE LOAD PROGRAM

PROJECT REVIEW

TRAINING

TURNOVER

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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COMPUTER SYSTEMS

SUMMARY OF MAJOR MILESTONES

Milestone	Target Date
1. Job Identification • Determination of the task to be accomplished, the time frame (implementation plan) to accomplish the task, the definition of the project's objective and the resources required to accomplish the task.	/21
2. DMS/QLP Generation and Testing • Generation of the various software components and testing the software using benchmark-type activities as well as documenting (for reference purposes) stability implications.	/6
3. Data Base Design • Design the data base, record characteristics, record relationships and the various storage structures associated with records and the access techniques.	/4
4. Data Creation • This highly critical step requires that EPA gather all necessary input data, define file formats with supporting documentation and present to Sperry Univac in whatever camouflaged manner EPA deems necessary.	/20

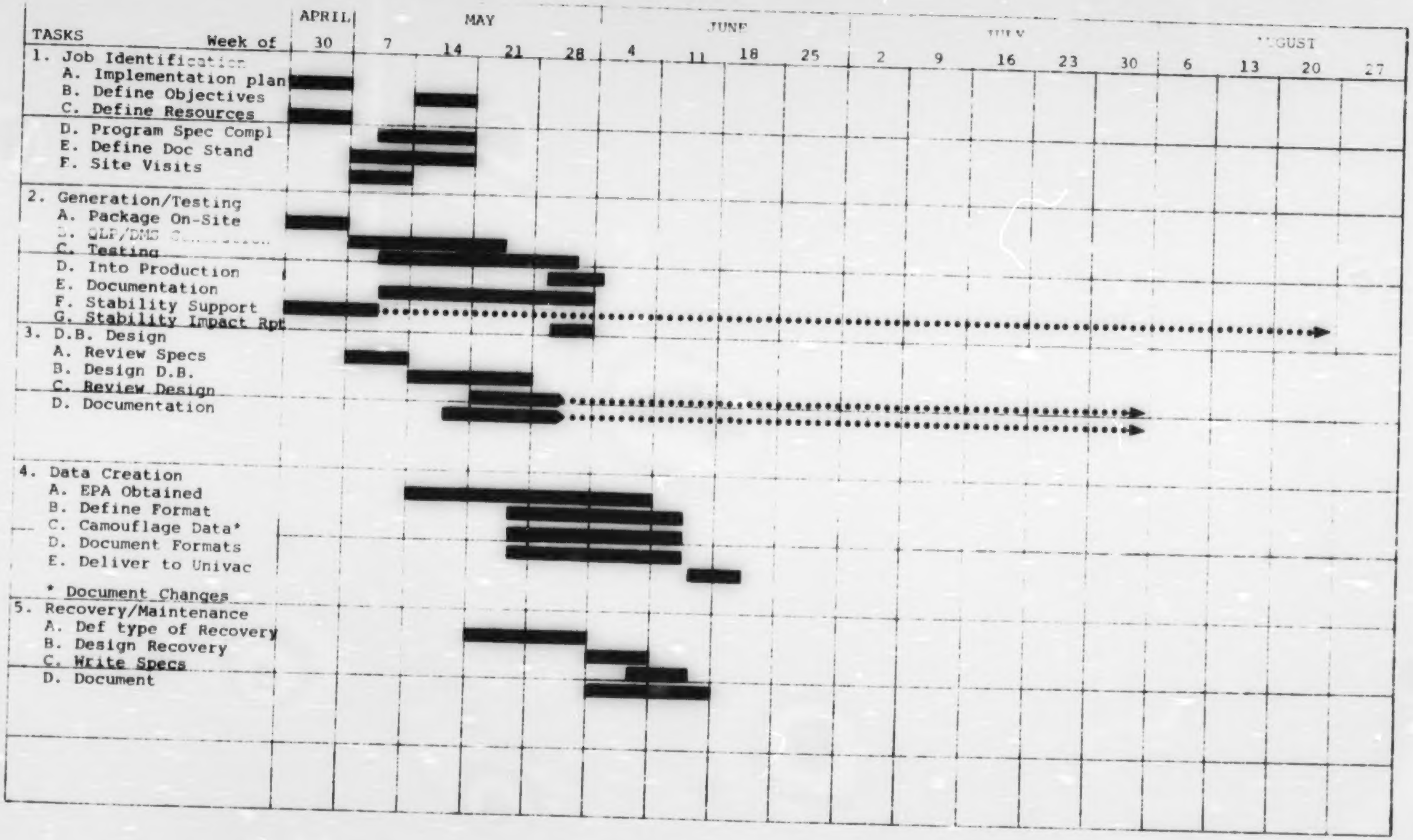
Summary of Major Milestones (Con't)

Milestone	Target Date
5. Recovery/Maintenance Procedures/Specifications • Determine what levels of recovery will be necessary based on the functions of the application.	6/17
6. Data Base Load • Write the application program to load the data base.	7/7
7. Data Base Manipulation Programs • Write all the necessary application programs which will access the data base and perform the EPA defined functional objectives.	7/30
8. Documentation • Although documentation is being gathered within each phase, this phase will serve as the central collection point for finalization prior to turnover.	8/26
9. Project Review • It is incumbent upon EPA and Sperry Univac to establish procedures for reviewing the accomplishments of each phase, including a demonstration of the project's functional capabilities.	8/5

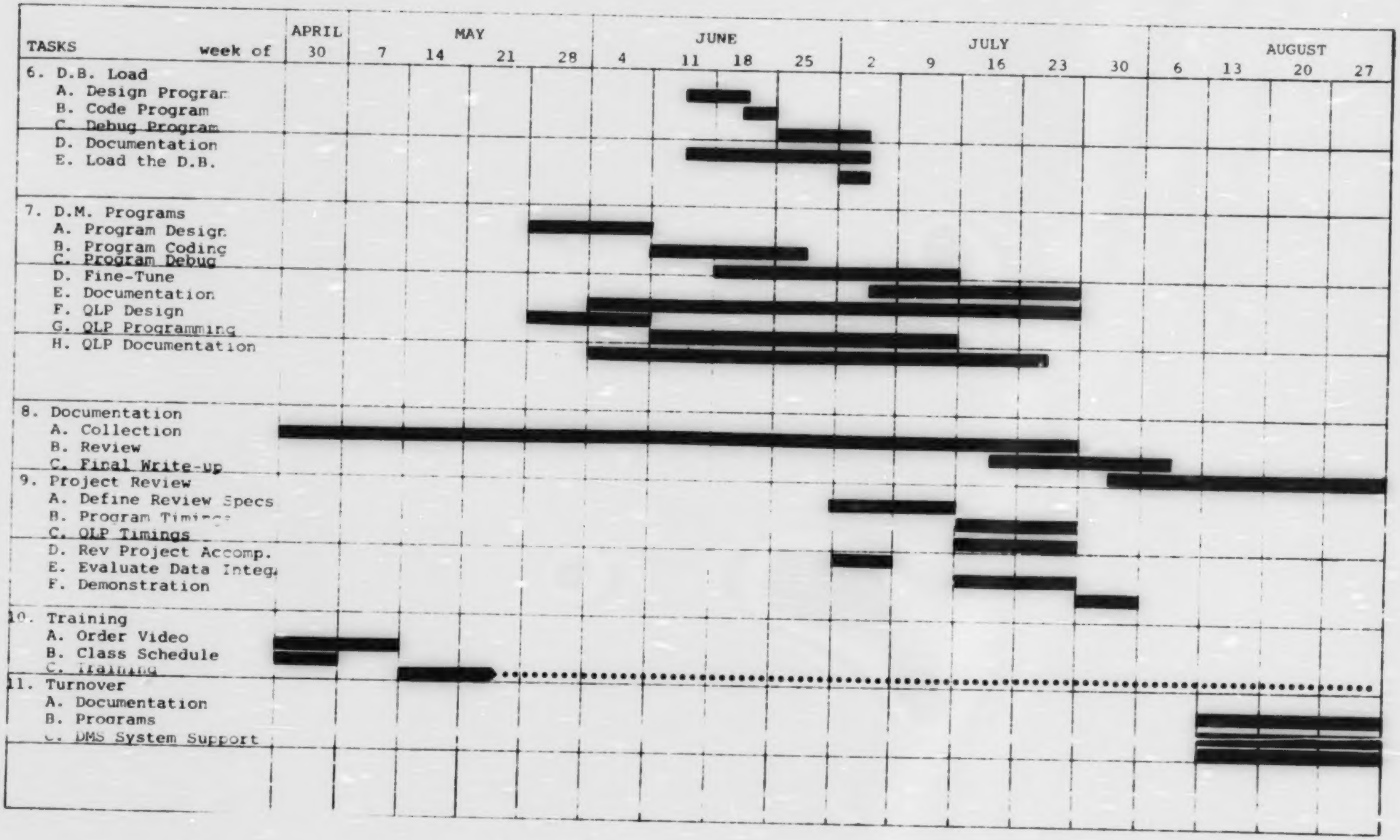
Summary of Major Milestones (Con't)

	Milestone	Target Date
10.	Training • Training will be a continuing process which only begins with this project.	8/13
11.	Turnover • EPA acceptance of the results of the project along with all software and documentation.	8/26

TIME SCHEDULE



TIME SCHEDULE



TASK: JOB IDENTIFICATION PERT NO: 1

DATES: Start 5/1 Complete 5/28

People Resource Requirement: 100 person hours

Person/Group Responsible: See Description

DESCRIPTION:		RESPONSIBLE:
A. Implementation Plan	5/1-5/7	Knudsen/Adam
B. Define Objectives • Functional requirements • Number of programs • Time frame of project • Evaluation Criteria	5/16-5/20	EPA/Adam
C. Define Resources • People • Machine facilities • Get account numbers	5/1-5/7	Univac/EPA
D. Complete Program Specifications	5/9-5/28	EPA
E. Identify EPA Documentation Standards/Format	5/7-5/28	EPA
F. Visit DMS-1100 User Sites. Note problem and special factors, e.g. stability impact, test planning, etc.	5/9-5/13	Adam

Dependency:

None

Other Comments:

TASK: DMS/QLP GENERATION/TESTING PERT NO: 2

DATES: Start 5/1 Complete 6/14

People Resource Requirement: 300 person hours

Person/Group Responsible: See Description

DESCRIPTION:		RESPONSIBLE:
A. ALP/DMS On-Site	5/1-5/7	Knudsen/Smith
B. QLP/DMS Generation Includes sysgen review meeting.	5/7-5/24	Adam/EPA Weber/Smith
C. Testing • Fire Up • Benchmark	5/11-5/31	EPA/Weber Smith
D. QLP/DMS in NCC Production	6/1-6/14	EPA/Weber
E. Documentation • Collection of procedures, problems, other factors associated with generation of system.	5/11-6/4	Adam/EPA/Weber/ Smith
F. Stability Support • Univac support of DMS/QLP software.	5/1	Adam/EPA/Weber/ Smith
G. Stability Impact • Stability impact report to EPA.	6/1	Knudsen

Dependency:

On Job Specification Step No. 1.

Other Comments:

Will require estimated 14 hours of computer blocktime (seven two-hour blocks on 1x1 system).

TASK: DATA BASE DESIGN PERT NO: 3

DATES: Start 5/7 Complete 6/28

People Resource Requirement: 100 person hours
Person/Group Responsible: See Description

DESCRIPTION:

		RESPONSIBLE:
A. Review Specifications	5/7-5/28	Adam/EPA/ISI
· Exact specification of programming functions and objectives.		
B. Design Data Base	5/11-6/28	Adam/Weber
C. Review Data Base Design	5/21-6/4	Adam/Wilson/Weber
D. Documentation	5/11-6/28	Adam

Dependency:

On Job Specification Step No. 1.

Other Comments:

TASK: DATA CREATION PERT NO 4

DATES: Start 5/14 Complete 6/20

People Resource Requirement: Unknown

Person/Group Responsible: See Description

DESCRIPTION		RESPONSIBLE:
A. EPA Obtains Data	5/14-6/11	EPA
B. EPA Defines Data/File Format	5/25-6/15	EPA
C. Camouflage Data • Live data is altered and such changes documented and cross reference to program produced.	5/25-6/14	EPA
D. Document file/Data Formats	5/25-6/14	EPA
E. Deliver to Univac	6/15-6/20	EPA

Dependency:

On Job Specification Step No. 1.

Other Comments:

Highly critical step. Delay in delivery of the data will slip EPA's time schedule.

TASK: RECOVERY/MAINTENANCE PROCEDURES/SPECIFICATIONS PERT NO: 5

DATES: Start 5/21 Complete 6/17

People Resource Requirement: 50 person hours
Person/Group Responsible: See Description

DESCRIPTION		RESPONSIBLE:
A. Types of Data Base Recovery Defined. EPA specifications for data integrity.	5/20-6/3	Adam/Weber/EPA
B. Recovery Designed	6/3-6/10	Adam/Smith/EPA Weber
C. Recovery Specifications Written and Incorporated into Data Base Programs, QLP and Data Base Load Programs.	6/7-6/15	Adam/Smith/Weber/ EPA
D. Data Base Recovery Area Documented per Documentation Specifications.	6/4-6/17	Adam/Smith/ Weber/EPA

Dependency:

A. Job definition must be explicit.

B. Documentation specifications must be complete.

Other Comments:

None

TASK: DATA BASE LOAD PERT NO: 6

DATES: Start 6/15 Complete 7/7

People Resource Requirement: 160 hours

Person/Group Resource Responsible: See Description

DESCRIPTION:

			RESPONSIBLE:
A.	Design Data Base Load Program	6/15-6/22	Adam/Weber
B.	Code Load Program	6/23-6/25	Adam/Weber
C.	Debug Program	6/25-7/7	Adam/Weber
D.	Documentation	6/15-7/7	Adam/Weber
E.	Load the Data Base	7/2-7/15	Adam/Weber

Dependency:

Totally dependant on customer supplied data and Univac completion of data base design (Steps 1, 2, 3, 4 and 5).

Other Comments:

TASK: DATA BASE MANIPULATION PROGRAMS PERT NO: 7

DATES: Start 5/28 Complete 8/28

People Resource Requirement: To be determined (Should not exceed approximately 500 man hours to meet target dates).

Person/Group Responsible: See Description

DESCRIPTION		RESPONSIBLE:
A. Program Design .Based on EPA functional requirements	5/28-6/11	*Adam/Smith/Weber EPA
B. Program Coding	6/11-6/30	*Adam/Smith/Weber EPA
C. Program Debug	6/18-8/28	*Adam/Smith/Weber EPA
D. Program Fine Tune	7/6-8/28	*Adam/Smith/Weber EPA
E. Documentation	6/3-8/20	*Adam/Smith EPA
F. QLP Design	5/28-6/11	Adam/Weber
G. QLP Programming	6/11-7/16	Adam/Weber
H. QLP Documentation .Includes a set of queries to demonstrate use and utility of QLP.	6/3-8/28	Adam/Weber

* Additional personnel, as needed

Dependency:

Steps 1, 2, 3 and 4

Other Comments:

TASK: DOCUMENTATION PERT NO: 8

DATES: Start 5/1 Complete 8/26

People Resource Requirement: 200 person hours

Person/Group Responsible: See Description

DESCRIPTION		RESPONSIBLE
A. Documentation collection for each task	5/1-7/19	Univac/EPA
B. Documentation Review by EPA for completeness and correspondence to documentation standards.	7/20-8/10	EPA
C. Final Drafts of all Documentation (Typed)	8/1-8/26	Univac/EPA

Dependency:

B. EPA documentation standards completed.

C. Typing support (EPA/NCC).

Other Comments:

In the final draft, a "cookbook" way of implementing DMS 1100 an application will be available and DMS experiences, problems and solutions and some DMS 1100 references will be included.

TASK: PROJECT REVIEW PERT NO: 9

DATES: Start 7/1 Complete 8/5

People Resource Requirement: 150 person hours

Person/Group Responsible: See Description

DESCRIPTION		RESPONSIBLE
A. Establish Review Procedures	5/1-7/15	Knudsen/Worley
B. Run Programs for timing (immediate series).	7/16-7/29	Smith/Weber/EPA
C. Run and evaluate QLP runs	7/16-7/29	Smith/Weber/EPA
D. Review project Accomplishments vs. Goals	7/3-7/8	Univac/EPA
E. Review the results for Data Validity. (Since live Data was changed, it must be doubledchecked for Integrity.)	7/16-7/29	EPA
F. Present system demonstration for Management and Potential Users. Demonstration includes overview presentation	8/1-8/5	Univac/EPA

Dependency:

A-D. All development steps must have been completed.

E. The Data-Changes were well documented.

Other Comments:

Two weeks time provides contingency allowance for changes. There will be weekly on-site review meetings and monthly project review meetings.

TASK: TRAINING PERT NO: 10

DATES: Start 5/1 Complete 8/13

People Resource Requirements: Unknown

Person/Group Responsible: See Description

DESCRIPTION		RESPONSIBLE
A. Order 1100 DMS Video Seminars	5/1-5/13	EPA
B. Furnish EPA Univac's DMS Customer Class Schedule (For classes of greater than 10 people, on-site training may be provided.)	5/1-5/6	Knudsen
C. Begin training. (Training will be a continuing item.)		EPA

Dependency:

None

Other Comments:

None

TASK: TURNOVER PERT NO: 11

DATES: Start 8/13 Complete 8/26

People Resource Requirement: 50 person hours

Person/Group Responsible: See Description

DESCRIPTION		RESPONSIBLE
A. Turnover completed Project Documentation. (Documentation to provide for EPA to take over the project.)	8/13	Adam
B. Deliver the Demo-Programs, DMS Libraries, the QLP and other related Software Items used in the project	8/19	Knudsen
C. System Contractor assumes responsibilities for Maintenance of Software	8/26	ISI

Dependency:

All other functions complete.

Other Comments:

Univac will now go into its standard site support mode. Univac will continue to be technical consultants and interface with the Roseville Development Center regarding any Software problems.

TASK: JOB IDENTIFICATION PERT NO: 1

DATES: Start 5/1 Complete 5/21

People Resource Requirement: 100 person hours

Person/Group Responsible: See Description

DESCRIPTION:

			RESPONSIB :
A.	Implementation Plan	5/1-5/7	Knudsen/A am
B.	Define Objectives · Functional requirements · Number of programs · Time frame of project · Evaluation Criteria	5/16-5/20	Worley/Ad n
C.	Define Resources · People · Machine facilities · Get account numbers	5/1-5/7	Univac/EP
D.	Complete Program Specifications	5/9-5/20	Worley
E.	Identify EPA Documentation Standards/Format	5/7-5/21	Worley
F.	Visit DMS-1100 User Sites. Note problem and special factors, e.g. stability impact, test planning, etc.	5/9-5/13	Adam

Dependency:

None

Other Comments:

TASK DMS/QLP GENERATION/TESTING PERT NO: 2

DATES: Start 5/1 Complete 6/6

People Resource Requirement: 300 person hours
Person/Group Responsible: See Description

DESCRIPTION:		RESPONSIBLE:
A. QLP/DMS On-Site	5/1-5/7	Knudsen/Smith
B. QLP/DMS Generation ncludes sysgen review meeting.	5/7-5/24	Adam/Oberchain/ Weber/Smith/ISI
C. Testing · Fire Up · Benchmark	5/11-5/31	Oberchain/Weber/ Smith
D. QLP/DMS in NCC Production	6/1-6/4	Oberchain/Weber/ EPA
E. Documentation · Collection of procedures, problems, other factors associated with generation of system.	5/11-6/4	Adam/Oberchain/ Weber/Smith
F. Stability Support · Univac support of DMS/QLP software.	5/1 - →	Adam/Oberchain/ Weber/Smith
G. Stability Impact · Stability impact report to EPA.	6/1	Knudsen

Dependency:

On Job Specification Step No. 1.

Other Comments:

Will require estimated 14 hours of computer blocktime seven two-hour blocks on 1x1 system).

TASK: DATA BASE DESIGN PERT NO: 3

DATES Start 5/7 Complete 6/4

People Resource Requirement: 100 person hours

Person/Group Responsible: See Description

DESCRIPTION:			RESPONSIBLE:
A.	Review Specifications • Exact specification of programming functions and objectives.	5/7-5/14	Adam/Worley
B.	Design Data Base	5/11-5/28	Adam
C.	Review Data Base Design	5/21-6/4	Adam/Wilson
D.	Documentation	5/11-5/28	Adam

Dependency:

On Job Specification Step No. 1.

Other Comments:

TASK: DATA CREATION PERT NO: 4

DATES: Start 5/14 Complete 6/20

People Resource Requirement: Unknown

Person/Group Responsible: See Description

DESCRIPTION:

		RESPONSIBLE:
A. EPA Obtains Data	5/14-6/11	Worley/EPA
B. EPA Defines Data/File Format	5/25-6/15	Worley/EPA
C. Camouflage Data	5/25-6/14	Worley/EPA
• Live data is altered and such changes documented and cross reference to program produced.		
D. Document file/Data Formats	5/25-6/14	Worley/EPA
E. Deliver to Univac	6/15-6/20	Worley/EPA

Dependency:

On Job Specification Step No. 1.

Other Comments:

Highly critical step. Delay in delivery of the data will slip EPA's time schedule.

TASK: RECOVERY/MAINTENANCE PROCEDURES/ SPECIFICATIONS PERT NO: 5

DATES: Start 5/21 Complete 6/17

People Resource Requirement: 50 person hours

Person/Group Responsible: See Description

DESCRIPTION:		RESPONSIBLE:
A. Types of Data Base Recovery Defined. EPA specifications for data integrity.	5/20-6/3	Adam/Worley/Oberchain
B. Recovery Designed	6/3-6/10	Adam/Smith/Weber/Oberchain
C. Recovery Specifications Written and Incorporated into Data Base Programs, QLP and Data Base Load Programs.	6/7-6/15	Adam/Smith/Weber/Oberchain
D. Data Base Recovery Area Documented per Documentation Specifications.	6/4-6/17	Adam/Smith/Weber/Oberchain

Dependency:

A. Job definition must be explicit.

B. Documentation specifications must be complete.

Other Comments:

None

TASK: DATA BASE LOAD PERT NO: 6

DATES: Start 6/15 Complete 7/7

People Resource Requirement: 160 hours
Person/Group Responsible: See Description

DESCRIPTION:

			RESPONSIBLE:
A.	Design Data Base Load Program	6/15-6/22	Adam
B.	Code Load Program	6/23-6/25	Adam
C.	Debug Program	6/25-7/7	Adam
D.	Documentation	6/15-7/7	Adam
E.	Load the Data Base	7/2-7/7	Adam

Dependency:

Totally dependent on customer supplied data and Univac completion of data base design (Steps 1, 2, 3, 4 and 5).

Other Comments:

TASK: DATA BASE MANIPULATION PROGRAMS PERT NO: 7

DATES Start 5/28 Complete 7/30

People Resource Requirement: To be determined (Should not exceed approx. 500 man hours to meet target dates).

Person/Group Responsible: See Description

DESCRIPTION:		RESPONSIBLE:
A. Program Design · Based on EPA functional requirements	5/28-6/11	*Adam/Smith/ Oberchain
B. Program Coding	6/11-6/30	*Adam/Smith/ Oberchain
C. Program Debug	6/18-7/16	*Adam/Smith/ Oberchain
D. Program Fine Tune	7/6-7/30	*Adam/Smith/ Oberchain
E. Dcoumentation	6/3-7/30	*Adam/Smith/ Oberchain
F. QLP Design	5/28-6/11	Adam/Smith/ Oberchain
G. QLP Programming	6/11-7/16	Adam/Smith/ Oberchain
H. QLP Documentation · Includes a set of queries to demonstrate use and utility of QLP.	6/3-7/25	Adam/Smith/ Oberchain

* Additional personnel, as needed

Dependency:

Steps 1, 2, 3 and 4.

Other Comments:

TASK: DOCUMENTATION PERT NO: 8

DATES: Start 5/1 Complete 8/26

People Resource Requirement: 200 person hours
Person/Group Responsible: See Description

DESCRIPTION:

			RESPONSIBLE:
A.	Documentation collection for each task.	5/1-7/29	Univac/EPA
B.	Documentation Review by EPA for completeness and correspondence to documentation standards.	7/20-8/10	EPA
C.	Final Drafts of all Documentation (Typed)	8/1-8/26	Univac/EPA

Dependency:

B. EPA documentation standards completed.
C. Typing support (EPA/NCC).

Other Comments:

n the final draft, a "cookbook" way of implementing DMS-1100 in an application will be available and DMS experiences, problems and solutions and some DMS-1100 references will be included.

TASK: PROJECT REVIEW PERT NO: 9

DATES: Start 7/1 Complete 8/5

People Resource Requirement: 150 person hours
Person/Group Responsible: See Description

	DESCRIPTION:		RESPONSIBLE:
A.	Establish Review Procedures	5/1-7/15	Knudsen/Worley
B.	Run Programs for timing (immediate series).	7/16-7/29	Smith/Oberclain
C.	Run and evaluate QLP runs.	7/16-7/29	Smith/Oberclain
D.	Review project Accomplishments vs. Goals	7/3-7/8	Univac/EPA
E.	Review the results for Data Validity. (Since live Data was changed, it must be double-checked for Integrity.)	7/16-7/29	EPA
F.	Present system demonstration for Management and Potential Users. Demonstration includes overview presentation.	8/1-8/5	Univac/EPA

Dependency:

A-D. All development steps must have been completed.

E. The Data-Changes were well documented.

Other Comments:

Two weeks time provides contingency allowance for changes.

TASK: TRAINING

PERT NO: 10

DATES: Start 5/1 Complete 8/13

People Resource Requirement: Unknown
Person/Group Responsible: See Description

DESCRIPTION:

			RESPONSIBLE:
A.	Order 1100 DMS Video Seminars.	5/1-5/13	Johnson
B.	Furnish EPA Univac's DMS Customer Class Schedule (For classes of greater than 10 people, on-site training may be provided.)	5/1-5/6	Knudsen
C.	Begin training. (Training will be a continuing item.)		Johnson

Dependency:

None

Other Comments:

None

TASK: TURNOVER PERT NO: 11

DATES: Start 8/13 Complete 8/26

People Resource Requirement: 50 person hours
Person/Group Responsible: See Description

DESCRIPTION:		RESPONSIBLE:
A. Turnover completed Project Documentation. (Documentation to provide for EPA to take over the project.)	8/13	Adam
B. Deliver the Demo-Progarms, DMS Libraries, the QLP and other related Software Items used in the project.	8/19	Knudsen
C. System Contractor assumes responsibilities for Maintenance of Software.	8/26	ISI

Dependency:

All other functions complete.

Other Comments:

Univac will now go into its standard site support mode. Univac will continue to be technical consultants and interface with the Roseville Development Center regarding any Software problems.

II.

SITES VISITED

II. SITES VISITED

As per NCC's request, Jeff Adams of Sperry Univac personally visited some SPERRY UNIVAC 1100 Series Systems where DMS 1100 had been installed and was operational. The purpose of the visits were to talk with the users, gathering a variety of information concerning their use of and experience with DMS 1100. NCC specifically requested information regarding manpower (support) requirements and system stability.

In my visits to the Bureau of Census, the Social Security Administration and one of Sperry Univac's sites in the intelligence community, as well as reference to papers written by various users regarding their particular experiences, the most significant, critical and recurring theme, dealt with the importance of the functional area of Data Base Administration. All too often problems occurring a year into implementation efforts could be traced directly back to inadequate or poor planning during the initial phases of the various projects. The success or failure of a DBMS implementation depends on management acceptance and support for thorough, exhaustive planning during the initial phase of an implementation. Information regarding support requirements and system stability is also heavily dependent on this initial planning phase.

It is very difficult to discuss system stability in terms of the data processing environment prior to installing DMS 1100 versus after its installation. So many variables enter into the stability consideration, level of user experience and the complexities of the operation are only a few of the considerations. It's also an attempt to compare apples and oranges, i.e., an attempt to compare processing using antiquated file management systems which force the user to be program-file dependent, versus the use of a data base management system which allows multiple, concurrent users to share the same information. If there was one particular user comment that stood out regarding DMS 1100 stability, it dealt with the problems encountered when an attempt was made to simulate an existing environment, substituting DMS 1100 for the existing file management system. By neglecting the importance of a thorough and total review of their needs and requirements, they paid the consequences of a partial or total rewrite when it came time to add a new application or functional area. Such an approach can create havoc within a user's environment.

The nature of any sophisticated software system, especially a data base management system, should be evolutionary, not revolutionary. DBMS's, in general, represent a more sophisticated means of managing data than exists with more traditional, program oriented data management systems. With our next major release, level 7R1, Sperry Univac's DMS 1100 will be in full compliance with the CODASYL recommendations for a data base management system, including sub-schema capabilities and access to the item level. It is worth re-emphasizing that although the CODASYL recommendations for a DBMS are revolutionary in concept, Sperry Univac's development of DMS 1100 has been evolutionary, if for no other reason than the complexities associated with a total data management system.

Of importance to NCC, as related to the need for and/or additions of local code to DMS 1100, I would recommend that this be avoided. The complexities associated with altering code require an in depth knowledge of DMS 1100's internal code and high degree of user sophistication. At this time, and for purposes of the PMIS, neither the need or requirement exists.

So many variables enter into any effort of determining what is meant by and needed for adequate site support. Emphasized in my initial remarks was the importance of the initial planning phase for a data base management system. Once the functional requirements have been defined, the data base administration function must control the design and implementation of the data base. The functions of data base administration may consist of one or more individuals, depending on such things as the size and complexity of the applications, the organizations management structure, and technical expertise.

The Census Bureau, for example has defined a central data base administration (d.b.a.) entity as well as satellite d.b.a. functions; this organization is an attempt on the part of the Census Bureau to satisfy the requirements of multiple and varied user application requirements. The Census Bureau is much like a service bureau, processing many varying types of mutually exclusive applications. The satellite d.b.a. will service the needs of a particular user at the local level. Once functional requirements have been worked out at the local level, the satellite d.b.a. will coordinate his users needs and requirements with the central d.b.a. entity. This approach will help to resolve potential conflicts between the central and satellite groups and their respective requirements.

As regards programming proficiency using DMS 1100 versus any other high level programming language, the requirements are not too different. Programmer experience and sophistication in the use of the particular program language, familiarity with various data accessing techniques, and the data structure of the data base will influence this proficiency.

Initially, NCC should be able to support its DMS 1100 requirements with one to two individuals supporting the data base administrator function. The responsibilities would require overall knowledge of application requirements, the ability to interface with the various management levels within the NCC organization, interfaces with the user community and control of all users accessing the data base, as well as performing the generation, maintenance and alternations to the data base.

III.

DATA BASE MANAGEMENT SYSTEMS

III. DATA BASE MANAGEMENT SYSTEMS

1. DMS 1100 INTRODUCTION

1.1. What is and why use a DBMS?

Let's first consider why an organization might consider the use of a data base management system, more specifically DMS 1100. To do this we can look at the more traditional approach to data processing and compare it to the data base approach. The traditional program approach is one in which a program is written to access a particular group of information for the purpose of performing some function or task such as generating a report or updating information. Typically, the programmer will determine his program logic and the file design requirements to fit this logic.

There are advantages and disadvantages associated with the program approach. The most significant advantage is that the execution of an individual program can often be highly optimized because of the ability to tailor the file design. But this approach has many disadvantages. For one thing the data structure is too closely tied to a particular program. For other processing to be performed, the data itself may have to be sorted and/or merged with other additional data. As additional application programs are written, the results can be the proliferation and profusion of files containing the same data in different formats and sequences. At some point in time, redundant data, i.e., data existing in two or more files, is likely to be only partially updated. That is, one file gets updated and another does not. These problems make it more difficult to add new programs to existing systems, due to the lack of control over data definition and where it resides.

The data base approach physically separate the responsibilities of data definition and storage structures from the programs which will access and manipulate the data. DMS 1100 provides for the storage of data in a non-redundant manner, allowing multiple users to share the information concurrently with one another. The data structure is the logical structure of the data base and typically reflects the organization's informational flows and processing requirements. The storage structure is the physical layout of the data on the data base with its associated chains, indeces, etc.

The programmer is required to design his programs in accordance with the rules of the data base. He does not perform file design. The advantages associated with this approach include increased control and centralization, both of the definition of the data base and the data itself; second, the elimination of unnecessary sorts and merges; third, the potential for eliminating redundant data exists; fourth, the ability to optimize total system performance; fifth, increased flexibility in terms of the capability to make changes or additions to the data base and minimize their effects upon already written application programs; and finally, application programming time can be reduced.

Associated with this approach however are the requirements for indepth, advance planning and design. Another portion of this paper will explore DMS 1100 user experiences and suggestions regarding this very critical area. Additionally, organizational adjustments may be necessary.

1.2. DMS 1100 Components

DMS 1100 is made up of 3 language components and the Data Management Routine (DMR) which is the heart or central component to DMS 1100, controlling all access to the data base. The three languages and their functions are:

1. The Data Definition Language (DDL) is used to define the data base, its structure and the relationship of data within the data base.

2. The Data Manipulation Language (DML) is the tool used by the programming staff to manipulate information on the data base and consists of a host language, such as COBOL, and DMS related commands.

3. The Data Manipulation Utility (DMU) language consist of a series of commands used to assist in monitoring and maintaining the data base.

Before looking at these in more detail, it may be worthwhile at this point to examine the data base design process.

1.3. Data Base Design

There are obviously many factors which influence data base design. These factors include data processing requirements, thruput, mass storage utilization, program mix, initial load, reorganization, rollback and recovery, privacy, and many more. There are a series of logical steps in data base design which must be performed by the Data Administrator using the DDL. Let us examine each of these steps in turn.

The natural starting point is with the information to be stored in the data base; information such as part number, order date, unit price, employee name, etc. Each unit of information is called an 'item'. The first step in data base design is the definition of the characteristics of all items of information to be included in the data base Using COBOL, the definition of item characteristics would be done in accordance with the rules of COBOL. Individual items must be named and may be either broken down, or combined with other tiems. Items must also be given a size character pattern definition as well as the primary mode of processing. Finally, repetitions of items, if any, must be indicated.

The second step in data base design is the definition of records, i.e., collections of related items. Each item in a record is stored physically adjacent to the next. From the application programmer's point of view, records are the basic unit of storage in the data base and the basic unit of access from the data base. From the system point of view, this is not the case, as will be indicated shortly.

Records may be defined in either ASCII or FIELDATA character format. However, the most significant characteristics of records is that they may participate in relationships with other records.

Having defined the items, and collected them together into records, the third step is definition of sets, i.e., logical relationship which exist between two or more record types. Sets are used to indicate a dependence, or relationship, between one record type, called the 'owner' and another record type, called the 'member'. These relationships may be defined as either permanent relationships or conditional relationships. The member records participating in the relationships may be maintained in either sorted or unsorted sequences and multiple relationships may be defined to form either hierarchies or networks.

The flexibility inherent in set definition is one of the major strengths of DMS 1100. For example, records may be defined as owners of more than one set, thus forming a hierarchical structure. Records may also be defined as members of more than one set, thus forming a network structure.

Having identified the records and the sets, that is, the logical data structure of the data base; the fourth step is the definition of the physical storage structures by which the records are to be stored and maintained on the data base. Another strength of DMS 1100 is that it supports a variety of storage structures. The Data Administrator may choose those storage structures which best meet his processing requirements. Within DMS 1100, records may be stored directly by supplying a data base key (location), through a key transformation algorithm, through an index, or based upon a relationship with other records. This latter relationship may be maintained either as a chain structure (ring) or a pointer array. Let us look at each of these storage structures in more detail, since proper storage structure selection is one of the keys to a good data base design.

Consider a store operation to place a new record into the data base. If the Location Mode of the record is Direct, the application program, or run unit in DMS 1100 terminology, must supply the DMR (the on-line component of DMS) with a data base key (from which the location of the record on the data base may be determined). The DMR stores the record at that location. On a retrieval operation the run unit again supplies the DMR with the data base key. The DMR uses the data base key to access the record and return it to the run unit.

Within DMS 1100, a "page" is the name given to the unit of I/O (block of data transferred) between mass storage and main memory. Typically, there is more than one record per page. The Location Mode of Direct has as its major advantages: simplicity and speed of access. Its major disadvantage is that the run unit must know the data base key of the record.

The second Location Mode is that of Calc. With this Location Mode, a key transformation algorithm (calc procedure) is used to compute the page number of record in the data base. This computation is based upon a value within the record itself. For example, employee number 42351 might calc to page 50, employee number 84362 might calc to page 65, etc. On a store operation the DMR extracts the value of the calc item and passes it to the calc procedure, which returns the page number. The DMR then stores the record on that page, assigning it a data base key. On a retrieval operation the run unit supplies the DMR with a value for the calc item. The DMR again passes it to the calc procedure which returns the page number. The DMR accesses that page and searches out the record containing that value. Duplicate key values may or may not be allowed at the option of the Data Administrator. Two standard key transformation algorithms are included in DMS 1100, however user algorithms may be substituted if desired.

On the data base all records which calc to the same page are chained together. The chain may extend over more than one page, if necessary, because of overflow. Either forward only or forward and prior linked calc chains may be specified. The Location Mode of Calc has as its major advantage: rapid random retrieval based upon a symbolic key. Its major disadvantage is that sequential processing in a logically ordered sequence, say by ascending part number, is normally not possible without performing a sort.

The third Location Mode is Index Sequential. With this Location Mode, a DMR maintained index is used to determine the page on which the record is stored. The index is automatically built when the records are intially loaded. After the index has been established on a store operation the DMR extracts the value of the index item and uses it to search through the levels of the index. The associated entry in the lowest level of the index contains the page number of the proper data page. The DMR then stores the record on that page, assigning it a data base key. On a retrieval operation the run unit supplies the DMR with a value for the index item. The DMR likewise searches through the levels of the index to determine the page number. The DMR accesses that page and searches out the record containing the value. Duplicate key values may or may not be allowed at the option of the Data Administrator. Partial key searches may also be made.

The index is maintained in a separate area (file) which typically is assigned to a higher speed mass storage device. The number of levels of index is under the control of the Data Administrator. Each entry in the lowest level of the index includes the page number of a data page containing index sequential records, and the highest index key value found on that page. The index sequential records are maintained in physically sequencial order, by index key, on the page. If a record logically belongs on a page, and there is insufficient space for storage, it is stored on an overflow page and a linkage between it and its logical position is established. The Location Mode of Index Sequential has as its major advantages: the ability to process either sequentially or randomly using a symbolic key. Its major disadvantage is the I/O associated searching through the levels of the index when they are not already in main memory.

The last Location Mode is Via Set. A set is defined as a one level hierarchical relationship between an owner record and member records. With this Location Mode, via set records are stored based upon their relationship to their owner record. The run unit must supply sufficient information to allow the DMR to determine the respective owner record on any store or retrieval operation via the set. The data base key of via set records is determined by the DMR. The DMR, unless overridden uses a place near strategy which groups the via set member records on the same page as their respective owners, thus allowing access to owner and members in one I/O. It is also possible to place the owner records in one area and the members in a different area. Each owner and its respective members are called a set occurrence.

The set relationship between owners and members is maintained on the data base using either of two storage structures. The first storage structure is through a Set Mode of Chain. A chain implies a forward pointer in the owner record to the first member record; a pointer in that member to the next member, etc. The last member record contains a pointer to the owner record, thus forming a ring. Forward and prior pointers as well as a pointer from each member directly back to the owner may be specified. Chains are most advantageous when either randomly or sequentially processing smaller numbers of related records, particularly if they are on the same page. The presence of prior and owner pointers facilitates network oriented processing where it is desirable to enter a record via one set and leave via a different set. The major disadvantage of chains is that random processing requires a sequential record-by-record search of the set occurrence and becomes time consuming if that set occurrence is large.

The alternate storage structure for a set is through a Set Mode of Pointer Array. In this storage structure, a pointer in the owner record points to an array which, in turn contains a pointer to all the member associated with that owner. Each member also points back to its owner. The array is automatically built and maintained in a separate area by the DMR. Pointer arrays are particularly advantageous when processing large numbers of records or when performing Boolean operations, such as comparing or combining different arrays. Because the array is sorted by the data base key, pointer arrays also allow sequential processing of all members on a page before accessing a different page. The major disadvantage of pointer arrays is the inability to have the array sorted and indexed on a key item within the member records, thus allowing random processing. This deficiency is provided for in Level 6 of DMS 1100, through the specification of Indexed Pointer Arrays.

We have spent quite a bit of time on storage structures. However, the time is worthwhile because these structures define the physical layout of the data base and thus are a major thruput consideration.

The fifth step in data base design is the definition of areas. Areas are the mass storage files into which the records are stored. An area is placed on random access mass storage, that is, a drum, disc, or fastrand. As mentioned, an area is subdivided into pages for I/O purposes. Typically, more than one record is stored on a page These records may be of the same type or of different types. Overflow pages may be interspersed with the data pages, or at the end of the area, or both. An area is also expandable in size through the Utility Processor; both in terms of the number of pages in the area and the length of the pages. The page size may vary from one area to the next depending upon the characteristics of the records to be stored in the area.

While space may be left on the data pages for the storage of new records, if the records are highly volatile it is often desirable to allocate overflow pages. Their use depends upon such factors as the frequency of storage of new records, time periods between reorganizations, etc. Interspersed overflow pages are typically defined to hold an expected number of new records without the need for excessive searching for space and without head movement. Overflow pages at the end of the area provide a second level of overflow.

Having formally discussed areas, we can now better define the term data base key. The data base key of a record is a system identifier from which a record location in the data base may be determined. The data base key consists of an area code associated with the area name, a page number relative to the area, and a record number relative to the page. Each record stored in the data base has a unique data base key assigned to it.

The sixth step in the data base design is definition of the data base integrity (rollback and recovery) requirements. A number of system considerations enter any discussion of rollback and recovery, which will be dealt with later.

1.4. Data Definition Language (DDL)

We have spent a considerable amount of time discussing the steps involved in data base design. Let us now see how this design is articulated using the DDL. Let us first examine the DDL in general, and then look at some examples of its use.

The Data Definition Language, or DDL, consists of syntax which closely follows the CODASYL standards. The term given by CODASYL to the definition of a data base is that of 'schema'. A schema consists of its identifying name, a definition of each area in the data base, a definition of each record in the data base, and, if included, a definition of each set in the data base. The area entry syntax provides for the definition of the characteristics for each area, which we discussed earlier. The record entry syntax likewise provides for the definition of the characteristics of each record. This includes such characteristics as the location mode of the record and the items comprising the record. The set entry syntax similarly provides for the definition of the characteristics of each set. This includes such characteristics as the mode of the set, the owner record, and the member records.

The software component of DMS 1100 used to process the Data Definition Language is referred to as the DDL Translator. The function of the DDL Translator is to accept DDL source input (source schema), perform syntax analysis upon the source input, and translate it into interpretive tables (objective schema) to be used by other system components. In addition, the DDL Translator performs cross reference, validity, and error checking on the object schema, generates a listing of the source input, and optionally generates a formatted report on the object schema.

Once the data base has been designed using the steps discussed earlier, the articulation of that design, using the DDL, is a very simple straight-forward process.

1.5. Data Base Manipulation Language (DML)

We have looked at the data base design process in detail. We have seen how the DDL is used to specify that design. Let us now examine the facilities DMS 1100 provides for manipulating the data base

DMS 1100 presently supports COBOL and FORTRAN interfaces to date and soon will support PL/1. If we use COBOL as an example, the Data Manipulation Language (DML) is an extension to ANS COBOL based upon the CODASYL recommendations.

DML's are provided for both Fieldata and ASCII COBOL The DML consists of a Schema Section which is the first section of the program's Data Division; and commands for manipulating the data base. These commands may be freely intermixed with the regular COBOL verbs in the Procedure Division.

The Schema Section is a UNIVAC extension to the CODASYL standard which identifies the schema, that is, the areas, records, and sets to be processed. The Schema Section also identifies the run unit and the interface locations between the run unit and the DMR. Lastly it defines the error handling procedure to be used by the run unit.

In the Procedure Division there are a number of DML commands. At the run unit level are the IMPART and DEPART commands used for run unit sign on and sign off. At the area level are the OPEN and CLOSE commands. These commands also indicate the intended form of processing; either initial load, retrieval, or update. At the record level are a number of commands; the FIND command is used to determine the existance of a record in the data base; the GET command is used to transfer the record to the run unit for processing; the FETCH command is used to combine the functions of the FIND and GET commands into one operation; the STORE command is used to add new records to the data base; the MODIFY command is used to alter the contents of existing records; and the DELETE command is used to purge existing records from the data base. At the set level are two commands; the INSERT command is used to establish a conditional relationship and the REMOVE command is used to terminate that relationship. There are also a number of status level commands: the IF command is used primarily to test for conditional relationships; the ON ERROR and AT END are command options for error processing. Of major significance are the KEEP and the FREE commands, as these allow the run unit to set or release locks on pages. There is one support level command, the LOG command, which allows the run unit to write user data to the audit trail tape.

The software component used to process a COBOL-DML program is the DML Preprocessor. The DML Preprocessor accepts the extended COBOL source input. It performs syntax analysis upon the source input and adds the source DDL record descriptions directly from the schema (the DML programmer never writes record descriptions). The DML Preprocessor also generates a data management communications area for passing status information between run unit and the DMR and, then; translates the DML commands into COBOL verbs. Source input and output listings are printed.

1.6. Data Management Routine (DMR)

We have now produced a run unit that is ready to execute against the data base. What happens when it is executed? This is where the Data Management Routine (DMR) comes into play. The DMR is the on-line component of DMS 1100. It is a reentrant processor, meaning there is only one copy in main memory servicing all executing run units. The DMR accepts the DML commands from executing run units, accessing the object schema if necessary, and then retrieves data from the data base or stored data on the data base. The DMR also passes status information to the run unit. Finally, the DMR is responsible for maintaining the integrity of the data base. This last item, integrity, is a big one which we will look at shortly. The run units might be any combination of Batch, Demand, or Real-Time programs, the latter being under the control of UNIVAC's Transaction Interface Processor, TIP 1100.

An integral part of the DMR is its System Buffer. It is into this buffer that all pages and tables are transferred. On retrieval operations individual records are extracted from pages read into the buffer and passed to the run unit. The run unit is never given direct access to the data or to system information. On update operations pages in core are altered accordingly by the DMR and returned to the data base only when necessary, based upon DMR buffer management algorithms. The DMR utilizes a system of locks and queues to maintain orderly processing and resolve conflicts between concurrent run units.

1.7. Data Base Integrity

For rollback and recovery purposes, the DMR maintains a before look file on mass storage. This file is often referred to as the 'quick look file'. The DMR also maintains a before look and after look file on an audit trail tape. A 'look' is defined as being nothing more than a picture of a page. Let us examine these rollback and recovery mechanisms in more detail as they are central to the data base integrity provisions of DMS 1100.

The quick look file is a file assigned to random access mass storage, either drum, disc, or fastrand. It contains quick before looks of those pages altered by a run unit. A before look is a copy of the page taken prior to its alteration. A quick before look is simply a before look written to the quick look file. Quick before looks are maintained in the quick look file for active run units and are released when the run unit issues a FREE or DEPART command.

The audit trail tape contains a permanent history of all data base alterations. This includes an altering run unit start and end sentinel, before looks of altered pages, and after looks of altered pages. An after look is a copy of page taken after the page has been altered and is about to be returned to the data base. Although the taking of looks is done at Data Administrator option and is transparent to the run unit, the run unit may log data of its own choosing on the audit trail tape, using the LOG command. Finally the system writes both checkpoints and recovery points to the audit trail tape. Checkpoints and recovery points are points in time to which the data base can be recovered.

Through the quick look file and the audit trail tape mechanisms, the system can insure the integrity of the data base under all conditions. DMS 1100 includes provisions for the following five progressive levels of rollback and recovery.

1. Command rollback -- in the event of an error or command, command rollback restores the data base to the start of the command.

2. Run unit rollback -- in the event of an error or upon run unit option, run unit rollback restores the data base to the start of the run unit or a prior point within the run unit. Because of the DMR's page lock mechanism and because quick before looks from the quick look file are utilized for both command and run unit rollback, other active run units are not affected and may continue their processing.

3. Quick recovery -- in the event of a system failure, quick recovery restores the data base to the state existing prior to the start of the active run units. Again, quick before looks from the quick look file are used to effect the recovery.

4. Selective Recovery -- in the event of a device failure, selective recovery restores affected areas of the data base to the current time. This is done by using after looks from the audit trail tape to re-establish the affected areas. While selective recovery is in progress other run units may continue processing in non-affected areas.

5. Long Recovery -- in the event of a massive failure, long recovery is used to restore the entire data base to a specified time. Long recovery also uses after looks from the audit trail tape.

1.8. Data Base Maintenance

This topic has been partially covered with the discussion of rollback and recovery. However, data base maintenance is an important topic in its own right. A system which provides tools to define and manipulate the data base, but no tools to maintain it, is not a complete system.

Performance of maintenance or utility functions is done through a utility language using syntax very similar in format to the DML syntax. When the Data Administrator is performing maintenance functions through the utility language, he is interacting with the fourth major software component, the Utility Processor (DMU).

The Utility Processor controls the execution of almost all system support functions or utilities. It may be used interactively from a console or in a batch mode. It accepts DML like syntax and is accorded full run unit protection by the DMR. That is, whenever necessary, locks on pages are set, before and after looks are taken, etc. The Utility Processor has a back door entrance into the DMR and utilizes the DMR routines whenever possible. All of the individual utility routines are overlay segments to minimize main memory utilization.

Our inventory of utility routines is not yet complete and more are being added with each new release. The following are representive of the functional capabilities of the DMU.

1. The INITIALIZE Utility, which performs off-line page initialization.
2. The DOWN Utility, which inhibits all run unit processing in an area.
3. The UP Utility, which enables run unit processing in an area.
4. The RECOVERY Utility, which selectively recovers individual areas.
5. The VERIFY Utility, which insures the integrity of calc records and chained set storage structures and collects statistics.
6. The PRINT Utility, which provides formatted printouts of pages or entire areas.
7. The DUMP Utility, which provides an octal printout of pages or entire areas.
8. The PATCH Utility, which alters any word in a page.

9. The EXPAND Utility, which increases the page size or the number of pages in an area,

10. The COMPACT Utility, which consolidates vacant space on a page.

In addition, there are a number of run streams included in DMS 1100 which are outside of the scope of the Utility Processor. These are used to perform such functions as initializing quick recovery or long recovery from the console.

1.9. Conclusion

To summarize everything said about DMS 1100 in just one word, that would be flexibility. DMS 1100 offers flexibility of data base design, flexibility of data base manipulation, and flexibility of data base integrity and maintenance.

2. INTRODUCTION TO QLP 1100

The SPERRY UNIVAC 1100 Series Query Language Processor (QLP 1100) provides a user with the facility for inquiry, update, and report generation processing of DMS 1100 data bases on SPERRY UNIVAC 1100 Series computer systems. Using a simple English language command syntax, QLP may be executed conversationally through standard 1100 EXEC demand interfaces or in a batch production mode through a standard 1100 EXEC run. Through QLP 1100, a user may select, retrieve, update, or create data in a DMS 1100 data base, or generate reports based on data in the data base.

2.1. Classes of Commands

The Query Language Processor supports seven classes of commands. These classes are:

- Data Base Communication (INVOKE, EXIT, HOLD, ROLLBACK, RELEASE)
- Inquiry (LIST, COUNT, BUILD)
- Report Definition and Generation (REPORT, PAGE, CONTROLS, etc., and GENERATE)
- Data Base Update (CREATE, CHANGE, DELETE)
- Control (REPEAT, SAME, CALL)
- QLP/User Interface (DEFINE, PURGE, FORMAT, SAVE, OUTPUT)
- Data Selection Clause (WHERE)

2.2. Command Specification

QLP commands generally include two specifications or clauses. The action clause is always present and is used to specify the requested action (retrieval, update, etc.) and the data base identifiers on which the action is to be taken. The WHERE clause is optionally required depending on the type of action clause. When used, the WHERE clause establishes the criteria which must be satisfied in order for the requested action to take place.

A second class of clauses is used primarily for the specification or description of report formats. These clauses are used within a report description in order to define the content and format of the report and the manipulations that are to take place.

Data Base Communication Commands

Command	Description
INVOKE	establishes a link between the user and the particular data base to be accessed. INVOKE PAYROLL OF ACCOUNTING
EXIT	releases the link between the user and the data base and terminates processing by the QLP.

Command	Description
HOLD	establishes the current state of the data base as that which is made available to any data base accessor in the event that recovery procedures are necessary. Any changes in the data base made subsequent to the HOLD command will not be permanent unless a RELEASE command or another HOLD command is issued or the QLP is normally terminated.
RELEASE	releases the hold and allows changes to the data base issued by the user since the last HOLD command to become permanent.
ROLLBACK	restores the data base to the state established by the last command which modified the data base or by the last HOLD command.

Inquiry Commands

These commands perform an action on the items in the data base established by their respecitive WHERE clauses.

Command	Description
LIST	provides the user with the values of the data items requested from the portion of the data base established by the WHERE clause. LIST PARTS WHERE PART-NAME = 'CARBURETOR' AND MAKE = 'WEBER' AND MODEL = '32FD'
COUNT	tallies the number of occurrences of the data items specified in the COUNT command action clause. The tally takes place only for that data qualified by the WHERE clause. COUNT STUDENT WHERE CLASS = 'DANCE EDUCATION'
BUILD	causes a sequential file of data items to be built from the portion of the data base established by the WHERE clause. BUILD COBOL FILE EMPLOYEES ON DISC FROM ; NAME DEPARTMENT LOCATION PHONE-EXT SORTED ; ON NAME WHERE EMPLOYER EQUALS 'SPERRY-UNIVAC'

Data Base Update Commands

Command	Description
CREATE	introduces a new record into the data base at the point of organization determined by the WHERE clause. CREATE EMPLOYEE RECORD WITH NAME = 'J. DOE' WHERE ; EMPLOYER EQUALS 'UNIVAC' AND DEPT = ; 'SOFTWARE DEVELOPMENT'
CHANGE	modifies, as specified, the data items listed in the action clause in those records established by the WHERE clause. CHANGE MARRIED EQUAL 'YES' WHERE EMPLOYER = ; 'UNIVAC' AND DEPT = 'SOFTWARE DEVELOPMENT' ; AND NAME EQ 'J.DOE'
DELETE	removes a specific record from the data base. The data to be removed in established by the WHERE clause. DELETE EMPLOYEE WHERE EMPLOYER = 'UNIVAC' ; AND NAME = 'J.DOE'

Report Definition and Generation

Command	Description
REPORT	defines, together with the subsequent PAGE, MARGINS, CONTROLS, SKIP, LINE and associated clauses, the desired report format, content, editing and line layout, control hierarchy, and desired heading and footings. These clauses and commands are known as the report description. An encoded version of this description is saved for later report generation.
GENERATE	causes the generation of a report defined earlier via a report description specification. GENERATE MONTH-SUMMARY WHERE DEPT-CD = '4 10'

Control Commands

Command	Description
REPEAT	executes the previous action clause with a new WHERE clause, thus establishing a different data selection criteria for the previous processing command. REPEAT WHERE EMPLOYER = 'SPERRY-UNIVAC'

Command	Description
SAME	used to signify, following the WHERE conditional conjunction, that the data selection criteria specified on the previous command is to be applied to the current command. `LIST SUPERVISORY DEPARTMENT WHERE SAME`
CALL	execute a command previously established through a DEFINE command. `CALL ABSENT`

QLP/User Interface Commands

Command	Description
OUTPUT	defines the output device for subsequent queries as either a demand terminal or an onsite printer. `OUTPUT TO PRINTER`

FORMAT	establishes a tabular output format and column headings for later use in a LIST or BUILD command.
	`FORMAT PHONES 'NAME' NAME '2' 'LOCATION' ;`
	`LOCATION '30' 'EXTENSION' PHONE-EXT '40'`

Command	Description
	In the preceding example, the numbers 2, 30, and 40 refer to the beginning column position of data to be printed in table form.
DEFINE	temporarily saves a QLP command for later use.
	DEFINE ABSENT LIST EMPLOYEE WHERE EMPLOYER EQ ; 'UNIVAC' AND (EMPLOYEE-STATUS EQ 'SICK-LEAVE' OR 'EMPLOYEE-STATUS EQ 'VACATION')
SAVE	permanently saves formats, reports, or procedures previously established through a DEFINE, FORMAT, or REPORT command.
	SAVE ABSENT
PURGE	removes a QLP report, format, or procedure from the QLP save file.
	PURGE ABSENT

Data Selection Clause

Command	Description
WHERE	specifies the criteria to be imposed upon the DMA 1100 data base for the purpose of the action clause processing. ...WHERE EMPLOYER EQUALS 'UNIVAC' AND DEPT EQUALS ; 'PERSONNEL' This WHERE clause establishes for action only those records associated, through DMS set relationships, with data items EMPLOYER and DEPT having the values 'UNIVAC' and 'PERSONNEL' respectively.

QLP 1100 supports a full range of arithmetic, BOOLEAN, and comparison logic.

2.3. Arithmetic Expressions

Arithmetic expressions may be used in subexpressions and in complex conditional expressions.

There are four binary arithmetic operators that may be used in arithmetic expressions:

Operation	Operator
Addition	+ or PLUS
Subtraction	- or MINUS
Multiplication	* or MULT
Division	/ or DIV

2.3.1. Formation of Arithmetic Expressions and Evaluation Rules

1. Parentheses may be used in arithmetic expressions to specify the order in which elements are to be evaluated. Expressions within parentheses are evaluated first, and, within nested parentheses are not used, or parenthesized expressions are at the same level of inclusiveness, the following hierarchial order of execution is implied:

   1st - Multiplication and Division
   2nd - Addition and Subtraction

2. Parentheses are used either to eliminate ambiguities in logic where consecutive operations of the same hierarchical level appear or to modify the normal hierarchical sequence of execution in expressions where it is necessary to have some deviation from the normal precedence. When the sequence of consecutive operations of the same hierarchical level is from left

to right. For instance, the following expressions are different in result due to the parenthetical grouping.

('1' + '10') * '20'/'5' = '44'

while

'1' + '10' * '20'/'5' = '41'

The expressions are evaluated from the innermost of the outermost level of parenthesization.

2.4. Subexpressions

A subexpression is a relation condition which, for retrieval purposes, has a value of 'true' or 'false' when evaluated by the QLP in the context of the data base. The inclusion in parentheses of a simple subexpression does not change in subexpression value.

2.4.1. Simple Subexpression

A simple subexpression is a comparison of two operands, each of which may be a data item, a literal, or the value resulting from an arithmetic expression. Any record for which the subexpression is true becomes a candidate for further qualification in the conditional clause; if all simple subexpressions of a qualifying expressions are satisfied, the record is retrieved for action processing.

The comparative-operators are

[NOT] GREATER THAN
[NOT]
[NOT] GT
[NOT] LESS THAN
[NOT]
[NOT] LT
[NOT] LESS THAN OR EQUAL
[NOT] LE
[NOT] GREATER THAN OR EQUAL
[NOT] GE
[NOT] EQUAL TO
[NOT] =
EQUALS
NE

The comparative operators specify the type of comparison to be made between the subject and the object of the subexpression. The range-operators are

[NOT] WITHIN RANGE
[NOT] WRG
[NOT] OUTSIDE RANGE
[NOT] ORG

The operands following the range operator specify the limits of the range; e.g., A WITHIN RANGE '1' '9' means A is greater than or equal to 1 and less than equal to 9. B OUTSIDE RANGE '10' '20' means that B is less than 10 or greater than 20.

2.4.2. Comparison

- Comparison of Numeric Operands

  For operands whose class is numeric, a comparison is made with respect to the algebraic value of the operands. The length of the literal or arithmetic expression operands, in terms of the number of digits represented, is not significant. Zero is considered a unique value regardless of the sign.

  Unsigned numberic operands are considered positive for purposes of comparison.

- Comparison of Nonnumeric Operands

  For nonnumeric operands, or one numeric and one nonnumeric operand, a comparison is made with respect to a collating sequence of characters associated with the data base subschema.

- Complex Comparative Expressions

  A complex comparison is a qualifying expression formed by combining simple relation conditions, other combined conditions, or other complex conditions with the logical connectors "AND" or "OR".

The logical operators and their meanings are:

Logical Operator	Meaning
AND	Logical conjunction AND; the expression is "true" (i.e., the data is qualified if both of the conjoined conditions are true; "false" if one or both of the conjoined conditions is false.
OR	Logical inclusive OR; the expression is "true" if one or both of the included conditions is true; "false" if both included conditions are false.

2.4.3. Conditional Clause Evaluation Rules

Parentheses may be used to specify the order in which selection criteria of complex qualifying expressions are to be evaluated when it is necessary to depart from the implied evaluation precedence. Conditions within parentheses are evaluated first. Within nested parentheses, evaluation proceeds from the least inclusive condition to the most inclusive condition. When the sequence of evaluation of consecutive operations of the same hierarchical level is from left to right.

2.5. Report Writer

The Report Writer feature of the Query Language Processor is provided as an integral facility of QLP 1100. It is used to produce reports from the data in the DMS 1100 data base. By using Report Writer commands, a user can define the layout, organization, and content of an output report.

2.5.1. Report Definition

A report definition consists of all clauses between the REPORT clause and the END REPORT clause. When QLP detects a REPORT clause, all input lines are treated as continuation lines until an END REPORT clause is encountered. Upon encountering an END REPORT clause, QLP will completely analyze the report description, list the complete report description with interspersed error diagnostics, and save the compiled report in a temporary save file.

3. DATA BASE ADMINISTRATION (DBA)

3.1. General Comments

A great deal has been written regarding the multiple and varied activities associated with data base administration. The purpose of this portion of the paper is to do nothing more than re-emphasize various aspects of the data base administrative function, and emphasize certain areas as they specifically relate to NCC's needs and concerns. Data base administration or DBA requires a special blend of talents and expertise without which a viable data base operation is not possible; the DBA is key to the success of data base implementation. It might be helpful to briefly review the history of the DBA function from the early CODASYL reports on data management systems to its present position. Following this history we will examine various aspects of the DBA function.

3.2. Historical Review

Well before the advent of the April '71 CODASYL DBTG Report with its historically significant identification and definition of the role of the Data Base Administrator, we find, if we look, incipient aspects of that task in earlier modes of DP activity. For example, certain installations have for years modified and standardized COBOL Data Descriptions calling such definitions into runs at compile time with a COPY verb. Such activity implied an overall cognizance of the common data needs of many disparate runs and resulted in de facto standardization of the size and syntax of data items.

In the May 1971 CODASYL Publication Feature Analysis of Generalized Data Base Management Systems, we find the first CODASYL reference to the function of the data base administrator as follows:

> "The data administrator is an individual responsible for a data base. His role is identified to some extent in both host language and self-contained systems. The important functions of data definition and file creation are each covered in a separate chapter, but there are other functions which are ascribed to the data administrator. Such functions include monitoring system operation, preservation of system integrity and security, and providing for restructuring the data base to accommodate new record types or new items. Some of the data administrator's functions may have to be performed with a programmer level language in some systems. In this case the designation of a function as an administrator function is subjective."

Elsewhere in the same report there is a chapter entitled "Data Administration Function" which further clarifies the DBA role as follows:

> "The data administrator has the function of using his superior knowledge of the set of applications using the data base in order to maintain its integrity and security.

> In this sense he is initially responsible for all issues concerning data definition (see Chapter 3) and creation (see Chapter 6). Specific data administration functions are identified as:
>
> - Assignment of pass keys.
> - Specifying requirements for logging.
> - Specifying an audit trail.
> - Storage of permanent programs.
> - Control over scheduling algorithm."

Proceeding to the next formal document - the first CODASYL DBTG Report (October 1969) we read the following:

> "When considering the history of control over data, we note that in the first generation each programmer had complete control over his data. In succeeding generations custody was relinquished to management and to the system. In this report the Data Base Task Group introduces the concept of the Data Base Manager. The Data Base Manager defines format, organization, and search strategies for data management. All data in the database is in his custody. He is responsible for maintaining existing relationships between data, establishing new relationships, and preserving the integrity and consistency of the data base. As an agent of management he is responsible for all management functions including:

a) Custody of the resources of the system both in the form of devices such as terminals, disc packs, etc., and processes such as language processors, program storage routines and the system routines available to the database management function.

b) Custody of all the on-and-off-line data in the database, and control of the description and content of all data in databases including security and integrity control. Control or knowledge of the organization of data not in a database may be unavailable to the database management function.

c) Establishment of the specific authority required to make use of descriptors of data elements, data items and system resources.

d) Assignment of the specific authorities to users of the system to make use of descriptors of data elements, data items and system resources."

On still another page of this report we read the following regarding the Data Manager function:

> "In an environment where a database includes data which is shared by many user programs, it becomes necessary for the schema and sub-schema to be developed centrally. In

> such a shared environment, a database is, in a sense, a compromise between the needs of the various user programs; the proper trade-offs can only be made centrally by a "Data Manager."
>
> "On the basis of information as to the data required by individual programs, statistics on usage of data, and response requirements, the "Data Manager" must make decisions; for example, on whether to repeat data redundantly and on what relationships to build into the database; and, based on these decisions, declare the areas, records, data-items, and sets required; and, if necessary, restructure the database."
>
> "It is assumed here that the "Data Manager" is a specialist person or group. Ideally, the function of the "Data Manager" would be performed by the System. The Data Base Task Group considered this but concluded that the techniques required are not yet sufficiently well-developed for it to propose a standard for the information which would be required for input."

In the next and final CODASYL DBTG report of April 1971 we find a considerable elaboration on the theme of data administration observing that the term "Data Manager" has now been replaced by "Data Administrator" whose function is described as follows:

"In an environment where a database includes data which is shared by many user programs it becomes necessary for the schema and perhaps the sub-schemas to be developed centrally. In such an environment a database is, in a sense, a compromise between the needs of the various user programs. The database will therefore require a means of mediating conflicting needs. This mediation is the prime responsibility of the Data Administrator. The term Data Administrator is used to emphasize the human activity involved in the performance of this function."

"Within the confines of this report the Data Administrator is assumed to be a specialist person or persons acting in this capacity. The Data Administrator function can be broken into three categories: organizing, monitoring, and reorganizing.

3.2.1. Organizing

"During this phase the Data Administrator builds the schema and perhaps the sub-schemas. The schema is always in the domain of the Data Administrator.

"He will:

- Employ a data structure(s) that models the business or problem. This is provided in the Schema DDL in terms of areas, records, sets, data-items, and data-aggregates.

- Assign names in such a manner as to assure their uniqueness.

- Select search strategies based on the needs of the various users of the database.

- Assign PRIVACY LOCKS and issue PRIVACY KEYS at various levels to the users of the database, based on need to utilize those portions of the database affected by the PRIVACY LOCKS.

- Assign areas to devices/media based on time/space requirements. (See Section 2.4)

- Load the database. (This can be done with the DDL/DML facilities herein specified, but specialized facilities for loading may be provided.)"

"Through arbitration with the various application areas the Data Administrator may be responsible for the building of the sub-schemas used for the application programs. In such cases he would:

- Assign names and/or synonyms to protect the uniqueness of the names already assigned in the database.

- Select and structure the proper subset of the database that must be available to the application programmer.

- Where applicable, alter the PRIVACY LOCKS and assign PRIVACY KEYS to the application programmers."

3.2.2. Monitoring

"It is the Data Administrator's responsibility to monitor the database for usage, response, privacy breach, and potential reorganization. He may use various logging facilities or sampling techniques to gather statistics."

3.2.3. Reorganizing

"As a result of information gained through his monitoring, or because of new information required in the database, the Data Administrator may have to reorganize the database. He may:

- Reassign areas to different devices/media (part of Device/ Media Control Language).
- Change the schema and/or attributes of elements of the schema.
- Change the database to reflect the changes in the schema (Restructuring).
- Remove "dead" records and compact space, ("garbage collection")."

3.3. Functions of the DBA

In the various CODASYL reports we have seen two terms 'data administrator', and 'data base manager', used to describe the person or persons who perform the data base administration function. We shall use the term 'data base administrator' recognizing that the term may change again in the future even though the function will remain.

From a review of the literature and contact with real-word DBA's, the various functions of the DBA can be broadly characterized as follows:

- Database design and definition
- Administrative and operational
- Monitoring and auditing

It is quite clear that the range of these functions exceed the capabilities of any single person in all but the smallest installation - hence the prevailing view that the DBA is a group or an individual in charge of a group to whom he delegates DBA authority and responsibility. The database can be thought of as a single unified resource of which the DBA is custodian.

Each of the above DBA functions is discussed separately in the following paragraphs.

3.3.1. Database Design and Definition

The function and sub-functions outlined below are an enumeration of possible DBA tasks derived from a 'review' of the literature and interviews with DBA's. Obviously, not all these functions will be addressed by each installation. Nevertheless, all potential major functions are hopefully included here and arranged into two major groups: data base design and data integrity assurance design:

Database Design

- Content definition (data item/records)
- Data definition (name/size/syntax)
- Data dictionary
- Logical structure (inter-record relationships via SET)
- Physical structure (logical-physical via AREA)
- Media allocation
- Retrieval and search strategies (direct/CALC/viaSET/Boolean)
- Data compression
- Archival considerations
- Reorganization and redefinition

Data Integrity Assurance Design

- System recovery
- Checkpoint/restart of run units
- Audit trail (before and after looks)
- Security dump (SECURE Processor)
- Hardware back-up
- Data back-up
- Access control (create/display/alter/delete/redefine)
- Cryptographic techniques
- Locks/keys

- Logging
- Error detection and correction feedback

3.3.2. Administrative and Operational

Following the key decision (in which the DBA may take part to opt for a data base management system, we encounter a second large area of expertise regarding the administrative and organizational functions expected of the DBA and required thereafter in the operation of the system. These are:

- Establishment and enforcement of policies, procedures and standards
- Liaison
  - Management and staff
  - Systems development (applications)
  - Users
- Guidance and assistance
- Database documentation
- Selection of database hardware and software
- Archival discipline
- Identification of emergent problems

It is generally conceded and reflected in salary levels that good administrative and management talent is scarcer than good technical talent. This therefore, might in the final analysis pose a bigger problem than the design aspect.

3.3.3. Monitoring and Auditing

Another significant role of the DBA is the monitoring and auditing of the on-going system with the goal of systems enhancement whenever possible. Organizations change, charters are altered, and ultimately the database must reflect new goals and changing emphasis as these occur. Systems monitoring and auditing are normally achieved through direct measurement and sampling techniques in two key areas:

- Usage information
- Response time

Significant alterations in these systems parameters can necessitate schema reorganization, modifications in access control, or any number of other changes. What is important is to be able to gauge the utility of the data base at all times and this presupposes points of measure together with special utilities that must all be considered at design time.

3.3.4. Systems Enhancement

As a result of monitoring and audit, the DBA will continually refine, enhance and 'tweak' the system as necessary to be more responsibe and economical of space. Typical refinements would include:

- Logical reorganization
- Media reallocation
- Sub-schema definitions
- Space compaction
- Change in archival methodology

In a sense, systems enhancement is a continuation of the original design process and embodies all aspects of that process. Thus, in an evolving system the design is really never completed.

3.4. Qualifications of the DBA Function

In discussing the various qualifications of the DBA certain qualifying themes do recur. Fortunately for the DBA they are no longer expected to co-exist in a single person. The four basic desiderata are:

- Very strong technical background
- Diplomatic capability (represent management/users/programmers/ etc.)
- Superior management capability
- Superior communication skills

In his researches on the role and functions of the DBA, James Fry of the University of Michigan notes that many organizations postulate a "superman" as the solution to the qualifications of the DBA.

Among the many talents required by this so called superman are the following:

- State-of-the-art awareness of DMS's in general
- Expertise in operations research
- Detailed knowledge of user requirements
- Detailed knowledge of the organization's total data base
- Ability to interface with diverse users

In the ACM address, John K. Lyon said of the DBA,

> "He must at once be technically qualified, if not inventive, and at the same time, exhibit the qualities of a clerk who will not make waves; he must encourage the users to work with him willingly and yet he will be forced to rule against their pet projects; he must represent both management and the users simultaneously; he must be all things to all people at all times. These traits will, in relative measure, be tempered by company policy and personality. While the nature of any single data base administrator role will be directly related to his and the user's strengths, he will exert increasing influence upon the data processing staff, the users and his company. In order that his influence is beneficial, his role must be viewed in terms of the community and not be restricted to the more narrow role as a librarian or documentation clerk."

3.5. Organizing the DBA Function

In the past, much of the authority and responsibility for these functions have been distributed among the users, programmers, operators, and hardware maintenance personnel. It is essential that the authority and responsibility for taking actions be established in the very beginning of any data base systems plan and that they be clearly assigned.

Some organizations possess fragments of these DBA function scattered throughout their operations. To formally establish the DBA position introduces problems of locating, training and retraining the DBA and associated staff. Some organizations have divided the DBA functions among a number of people. This has its practicle implications in terms of manageable entities but ultimately, there must exist some central position of authority and responsibility for the data base management system.

3.5.1. The Significance of the DBA Function

An organization's data is an important and valuable resource. One measure of its importance would be to consider the cost of doing without it. Management does not always have a complete picture of, or control over, this costly resource. Several different groups within an organization may be responsible for constructing and maintaining separate files. In order to manage this costly resource properly, management must become aware of its value. Given this awareness, managers would be expected to conserve and economize the use of this resource, establishing and enforcing a more disciplined use of data throughout the organization.

3.5.2. Administrative Considerations

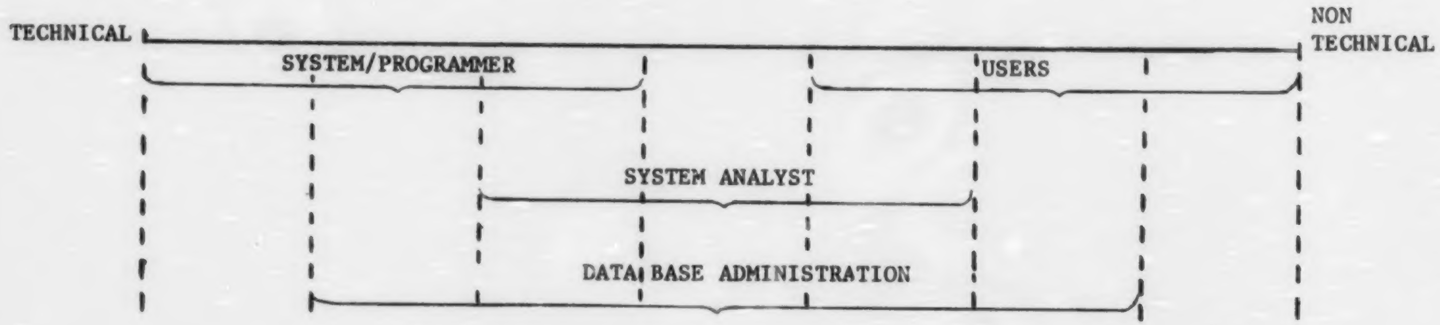
A comprehensive approach to data base administration has significant impacts on the system development process, on resource requirements and on operational procedures. The scope of implementing and utilizing data bases require centralized planning and control. The size of staff needed will vary depending on the implementation strategy. Extensive training and orientation is required to maintain the awareness levels between users, systems, and management.

It becomes readily apparent upon investigating data base management systems that one of the mandatories is the interrelationships of people involved in design implementation and subsequent expansion of a data base management system. Many organizations have attested to the failure of the data base approach. The failure cannot be blamed on the integrated data base concept but rather the inability of the organizations to completely understand the impact of such an approach. Levels of technical, as well as managerial skills, have been badly underestimated. Reemphasizing a point, the key to effective data base design and implementation lies with the proper integration of a group of people across the entire spectrum of an organization (users, systems and managememt).

3.5.3. One Users Experience (Consolidated Paper, Inc.) The following information represents some experiences and problems encountered by Consolidated Paper, which NCC may wish to consider in guiding their thoughts on the use of DMS 1100. As indicated by the "Application Planning Spectrum" chart, Consolidated found it convenient for their purposes to uniquely identify functional areas of responsibility such as SYSTEM PROGRAMMING, USERS, SYSTEM ANALYST, and DBA. It should be noted that this represents one approach. Others exist; this worked for Consolidated.

APPLICATION PLANNING SPECTRUM

USING DMS-1100


TECHNICAL
NON TECHNICAL
SYSTEM/PROGRAMMER
USERS
SYSTEM ANALYST
DATA BASE ADMINISTRATION

SYSTEM PROGRAMMER

Training

Care should be taken to allocate sufficient time for the System Programmer to absorb the tremendous amount of material in the DMS-1100 manuals. This person should have a good knowledge of the EXEC, COBOL, and assembly language programming, and a firm grasp on file structures.

Experimentation

The DMS-1100 documentation certainly does not rank high on the list of all-time favorite fireside books. The best way to gain a feel for the tool is to allow the System Programmer sufficient computer time and direction to gain familiarity with the new concepts.

Software Testing

Once proficiency is gained, the System Programmer should develop some programs to run under DMS-1100. Included in this phase should be such things as downing mass storage while run units are active, extensive testing in the area of recovery, X-off run units while they are active, learn the II functions. If possible, actual hands-on computer operations is the best approach.

Load Programming and Maintenance

Probably the first real gains will come when the first load program is written. To avoid a great deal of frustration, beg, borrow, or steal a copy of "Data Base Loading Techniques" prepared by Bruce Casky of Sandia Labs, which was presented at the January, 1974 meeting of the DMS-1100 subcommittee. This document should be included directly into the reference material. Another must is the LINKER Statistics Package" prepared by Barry Shuman and available through UPLI.

Application Programming Support

The experience gained from the preceding areas will serve to assist application programmers. It may prove worthwhile to have the first application programs pass his desk for review where he can offer advice on record retrieval and storage.

File Assignment and Allocation

As new applications come on-line, a considerable amount of time will be required to prepare file assignments and distribute the files for efficient operation.

New Release Generation

All the previously mentioned knowledge makes this person a natural to perform this function. As enhancements become available, he should be responsible for this proper integration.

Program CALC Routines

Once again, the System Programmer's experience in assembly language and knowledge of file structures will be helpful in programming the specified algorithm into a CALC routine.

Implementation Schema Modifications

This will be a continuing process and the responsibility of this function should be clearly identified.

SYSTEM PROGRAMMER - DATA BASE ADMINISTRATOR

Establish Generation Parameters

As the role of the DBA becomes more refined he will by necessity have to forego some of his highly technical skills. By interaction between the SP and DBA, each with their own level of expertise, an efficient generation can be achieved from an overall performance standpoint.

Brainstorming

Office doors should always be open to this activity. It takes quite a while for the waters to clear in many areas and these sessions sometimes result in the establishment of a special test to be implemented by the SP. As a helpful hint, get into the habit of prefixing remarks with the words "fact" or "speculation". This will avoid a lot of dead ends. Each, of course, should be allowed to exercise his own verbal creativity if long recovery doesn't run.

Determine File Requirements

As preliminary estimates of application file space become available, considerations must be given to their location along with quick-look file space and system file space. For example, if the individual transactions perform a gread deal of file modification, the quick-look space may have to be enlarged. This could be a problem if file space is limited or more than one run unit will operate concurrently.

Establish Special Tests

The responsibility of the SP and the DBA interaction lies mostly with preparing an environment in which the applications can operate. Considerable attention should be given to DEADLOCK situations between run units. A well planned test of multiple run units will give a good handle on the placement of KEEP's and FREE's.

Review Overall Performance

As multiple systems are included in the data base, conflicts may occur that cause a degradation in performance. We recommend the proper instrumentation be included to identify these areas so corrective action can be taken. SIP should suit these needs nicely.

SYSTEM PROGRAMMER - DBA - SYSTEMS ANALYST

Training

Assuming the Systems Analyst is not familiar with data base concepts, time should be allocated for formal education. As a supplement, the SP and DBA can be of considerable service to the SA in helping him relate application requirements in a more effective and meaningful manner. We are striving for the goal where eventually all our analysts are intimately familiar with data base design.

Schema Refinement

The analyst, of course, has the responsibility of relating the user's needs to the computer. He has a better handle of data sort requirements, duplication of data considerations, and records most commonly referenced. A good rapport among the SP, DBA, and SA is very important since the SP and DBA are concerned with integrating the application for which the analyst is responsible into the overall system. Most commonly discussed here are linkages between records and methods of retrieval.

Recovery Requirements

The analyst is also deeply concerned with the ability to recover the data files in the event of failure. The SP and DBA are more directed to system recovery as a whole. Since the requirements of applications vary in this area, a good decision can be found among the three to suit each one's needs.

Testing Procedures

The application testing is also the responsibility of the analyst. However, in a data base environment conflicts can occur with other production applications. Here is where the decisions are made as to duplicate master files under a different name, changes in scheduling to avoid conflicts, or separate schemas.

System Trade-Offs

The purpose here is for the SP and DBA to explain to the SA the most effective way he can relate his application to the data base system.

By communicating the problem of "place near logic" or the overhead incurred with sorted sets or "INSERT" commands, a leveling can be achieved for the overall system.

Resource Utilization

Through this interaction, the analyst is informed as to any system limits that may exist and, conversely, allow the SP and DBA visibility of requirements.

DBA - SYSTEMS ANALYST

Training

Initially, this would start out where the DBA is a resource to the SA as he becomes more knowledgeable. Eventually, this area could evolve directly to the Preliminary Schema Design.

Application Analysis

This is the prime responsibility of the SA. However, periodic discussions and the inclusion of the DBA in review meetings may bring problems to light that can be readily solved before they have gone too far. It can also help the DBA anticipate future demands on his time and the overall system.

Record Definition

Also the prime responsibility of the SA. Helpful hints by the administrator from previous experiences may be useful in the test and debug phase.

Security

The DBA has the responsibility of explaining to the analyst what tools are available to ensure the security of the files. Should the analyst find them insufficient or impractical they can collectively seek a solution acceptable to both.

Integration

The DBA generally has the responsibility of ensuring the data base is properly integrated. His overall knowledge of application demands on the base should prove helpful to the analyst to avoid unnecessary data redundancy and conflicts.

Preliminary Schema Design

This is the first pass at relating the application to the data base. Such questions as data availability, response time, CALC algorithms, and general system requirements will begin to come to light here.

SYSTEMS ANALYST - DBA - USER

Application Training

As new applications are planned, the user and SA should become involved in a training program where each becomes aware of each other's needs. The DBA, having overall integration responsibility, should be included in this area but only from a general appreciation standpoint. He should not concern himself with details that are the responsibility of the analyst nor stifle the analyst's creativity.

Parallel Testing Requirements

Since most new computerized applications replace or enhance some current manual systems, a clear understanding as to the impace on the user department should be explored between the analyst and user. The purpose of the DBA here is to advise the analyst and user as to possible conflicts with other applications but only as they relate to the data base.

System Specifications

Historically, this has been the responsibility of the analyst and user. The DBA should only be included on an "as needed" basis.

Implementation Schedule

Same as System Specifications.

System Effectiveness

This is what is commonly known as the "post mortem" where differences between "what was asked for and subsequently received" are resolved. Once again, the DBA should be available on an "as needed" basis to explain discrepancies in the system performance area. Oversights in the application should not be his concern unless very critical.

DBA - USER

Training

The user may require training to relate his needs more effectively. If so, the standard symbol notation of rectangles, solid arrows, and dashed arrows can serve the user and the DBA well. For example, we have published a DATA BASE PRIMER for our user departments to explain the concepts. If the user takes time to understand this notation he won't be left in the dark when technical discussions develop on data interrelationships. The DBA should also learn as much about the user's profession as possible by requesting the user to train him or attending evening classes.

Future Planning

This is a two-way street, also. In many cases some users will not be involved in initial implementations. However, they should be kept periodically informed as to progress so they will not be subjected to rumors and misinterpretations. Additionally, the DBA can "check the pulse" of the users as to their attitudes and feelings.

Brainstorming

During scheduled meetings with a planned agenda, always allow time for brainstorming. Once the user gets a feel for what data is available in the base, he may well be inspired to offer suggestions as to how he can be helped even on an interim basis. For example, we are now supplying data to our Transportation Department for projection of shipments on their own suggestion because they asked a question on data availability.

USER

Training

Each user who supports or utilizes the data base should avail himself to training in the operation of interfacing departments. B broadening their scope on overall company operations, they will develop a better feel for timing requirements and other user demands.

Commitment

The user must also recognize the fact that he is no longer isolated but part of an overall team. He will have to be prepared to commit more of his time and resources in support of a data base environment.

As a rule, when one operating department gains an advantage through new procedures or systems, it is at the expense of somebody else. It may be necessary to incur additional departmental overhead in support of an overall savings.

Involvement

All departmental managers should become actively involved even if their attitudes lie in a conservative direction. The conservative user has a definite place on committee efforts to bring the "blue skyers" close to reality.

Authority

Each user should have individual authority to make necessary changes in support of company requirements as a whole. Recognized authority by his superiors will assist in avoiding costly delays.

Of course, all of this is worthless unless one element is included, namely, top management approval. There are a tremendous amount of resources committed to data base development and they must be convinced their dollars are being spent wisely and the payback worth the investment.

To give an example on how all these interactions actually produce results, let me introduce Mr. Gene Glowienka, our Chief Cost Accountant and Chairman of the Financial-Production-Marketing Committee.

APPLICATIONS PLANNING FROM A MANAGEMENT VIEWPOINT

E. J. Glowienka
Consolidated Papers, Inc.

During 1972, a management decision was reached to develop a computerized financial reporting system for Consolidated Papers, Inc. over a period of 3-5 years. The Product Cost System was chosen as the starting point because it is used by many departments for various reports. Although the product cost itself is simply add, subtract, multiply, and divide routines, it is made up of about 1,000 data elements and extensive clerical effort is required to prepare one product cost. Immediate payoff could then be realized in the form of reduced clerical overtime premiums. For example, the manual preparation of 1973 standard product costs for four divisions required approximately 300 hours of overtime. In addition, the Standard Product Cost provides information for other reports such as variance from standard for operating people, profit analysis, long-range material requirements, development of the profit plan, determination of the cost of changing specs, etc.

A committee approach was decided upon. This committee consisted of representatives from Information Systems, (Lead Systems Analyst, Manager of Systems Analysis, and Manager of Technical Development), Purchasing, Accounting, Marketing, Operations, and myself as chairman representing the Cost Departments and Financial Planning and Control. It is extremely important that a committee of this kind be given the authority to cross departmental lines. If this is not accomplished, it can become very easy to build a monument to a committee. No one is an expert in all fields. Those of us on the administrative and staff level sometimes find it difficult to relate to operations problems and the reverse is also true.

The committee was organized in January, 1973, and the early meetings were confined to learning and existing manual system, defining terms, creating an overall plan, and understanding each other's problems. Many times when a committee approach is used, it becomes very easy for the chairman to impose his ideas on the group and as a result the meetings become a drag and very little is accomplished. It is a much better idea to have the chairman assign definite tasks to each member, and to establish mutually agreed upon deadlines for each assignment. Preferably these assignments should be made in such a way as to require members to become familiar with areas where they have very little prior knowledge. This helps promote mutual understanding of each other's problems.

During this early planning period, our committee met weekly and each member with an assignment was required to report on his progress. We found that with this approach we were able to keep the meetings short (most lasted less than two hours) and interesting; everyone was involved. The committee then prepared tentative system specs and proposed formats of output forms. At this point, approximately June, 1973, the system design was initiated and Cost Department supervisors who would ultimately be responsible for keeping the system operational, were called upon for their ideas and specific needs.

These meetings with the final users were extremely helpful in determining which items were actually data elements and which resulted from calculations. Several meetings were held during which final systems specifications were developed and output formats finalized. In addition, programming hour requirements were established as well as deadlines for system output. Decisions were also made as to the best method of establishing the required data base since none was in existence. It was decided that the 1973 standards would be used even though this would require a significant amount of hard coding.

This enabled us to accomplish several things; establish the data base as well as having available much more data for systems and programming testing. Even though this required approximately 100 clerical overtime hours to accomplish, we were able to update the data base for 1974 much quicker, because the system was designed to require updating of only the data elements that changed rather than updating the entire data base. Training sessions with the users were also held during this period to acquaint them with the steps required within the system design and to familiarize them with the use of the coding documents.

Speaking as a user, some special considerations in the system design have made my job easier. For example, each year when the standard product costs are changed, I am required to prepare a comparison report for top management detailing the major differences in product costs. In the past, this meant spending many hours of manual comparisons. The magnitude of this effort is apparent when you consider that each product cost contains approximately 50 line items and there are about 300 products to compare. Enough flexibility was provided in the new system to detail differences by line item. This permits me to provide management with a much better report on a more timely basis. Although this management group is usually only interested in major differences, I have had several occasions in the short time the system has been operational, to provide them with as much detail as they desire simply by looking at the comparison report.

Flexibility was also designed into the system to permit changing any data element without destroying the standard. This is commonly called sensitivity analysis. We all look for ways to make our product better at less cost. In our company, each division has several product engineers continually exploring changes and requesting cost data on each. With the manual system these process changes were not always pursued, because of the time involved. To make one change in the manual system required approximately 1/2 hour or manual effort to complete and additional effort to prepare an analysis. In most cases, 36-48 hours were used before any decisions could be made. Recently, I was asked to do not 1 but 24 interrelated calculations and comparisons. I was able to complete this request in less than 1 hour, including the coding of data and the computer time. This included all computations, comparisons, and final reports. This represents a major improvement in our ability to respond to requests and we haven't even begun to exploit other features designed into the system.

In summary, these points should be kept in mind:

1. When a committee approach is used, be sure enough authority exists to cross departmental lines.

2. Committee members must be active. Definite tasks should be assigned and periodic reports required. Preferably, some of these assignments should be made in areas other than their own sphere of interest. This promotes mutual understanding and insight into each other's problems.

3. Ultimate users should be brought in at the earliest opportunity to become aware of each other's needs.

3.6 Other Areas Which NCC Might Consider

3.6.1. Organizational Changes

The integration of data bases across user lines may require changes in organizational approaches.

3.6.2. System Development Process

In a non d.b.m.s. environment, the development cycle for new applications usually involve an interaction between the user and the programmer, who may have little or no regard for what applications presently exist (some of which may be beneficial to this 'new' effort) or the availability of common data. In a data base environment, the users requirements are viewed from the point of whether sufficient data exists in the d.b. to satisfy the user's requests.

3.6.3. Computer Resources

One of the advantages of a data base system is the reduction in the amount of redundant data which must be stored. Getting to this point requires the analysis and conversion of the multiple application and their associated files.

Data base systems are usually associated with on-line systems.

Generalized systems tend to be more complex comprehensive and difficult to develop than more traditional file oriented systems. Development cycles for some large projects may be lengthened in order to promote a smoother operation once the system is in production.

3.6.4. Operational Procedures

Introduction of a data base system in an operational environment requires a large degree of sophistication on the part of operation's functions to resolve problems. An operator's error may result in system disaster. The highly increased level of operational automation associated with data base systems may result in long periods of operator inactivity, likely to result in a loss of concentration, combined with bursts of critical activity during which decisions must be reached and implemented. Quality people and training are an obvious deterrent to problems in this area.

3.6.5. Cost Effectiveness

Data base systems are not cost effective for the development of one-time collection and use. In order to determine some trade off point between the one-time shot and recurring activity, perform a parallel sample system of an existing application under the d.b.m.s. versus its present operating environment and compare notes. In addition to variable costs associated with each application, it will be necessary to determine fixed overhead associated with centralized data base support and establish policy on how these costs are to be charged against projects.

- Training and Orientation

  Data Base Management Systems require bredth and depth of knowledge, not only of an organization's purpose but its potential. Data Base Management Systems will test and tax existing levels of technical and managerial knowledge. Training must place emphasis on the functional organizational structures, as well as the potentially complex concepts inherent in utilizing a data base. (Keep in mind there are many simple data base applications but the potential complexities is nothing less than astounding).

3.6.7. Technical Considerations

Major technical considerations which must be addressed include data documentation, hardware constraints, software development, data base design, recovery, integrity security, retrieval requirement, data base maintenance and/or organization.

3.7. Summary

The following comments summarize certain areas which NCC must be aware of in considering a DBMS.

3.7.1. Planning and Control

A. Develop a planning and control function for data bases at the the high staff level.

B. Select implementation strategy from among alternatives.

C. Establish developmental milestones.

D. Preliminary estimate of organizational effort in each area, including application divisions, and prepare organizational plan needed to support data base administration.

E. Establish performance goals and appropriate policy for data base operation and assign responsibility.

F. Establish fixed cost overhead associated with data base administration for use in project cost estimation and budgeting.

G. Coordinate data base implementation with other major system development and implementation.

3.7.2. Data Base Standards/Policies

A. Develop agency policy on:

1. Data ownership

    2. Data manipulation
    3. Data retrieval
    4. Security

B. Develop data base standards for:

    1. System requirements
    2. System specifications
    3. System documentation
    4. System design
    5. Operational performance

3.7.3. Position Descriptions/Interface Responsibilities

A. Survey a sample of organizations which have implemented data base administration to determine types of specialists required in practice, job descriptions, and competitive salary levels.

B. Define specialized support functions required and their interface with other activities, establish positions and recruit qualified personnel.

C. Clarify application analyst and user responsibilities.

D. Establish communication procedures and interface requirements between user, application analyst, and data base specialist.

3.7.4. Orientation and Training

A. Provide internal presentations to promote understanding of concepts and problems involved when implementing data base administration.

B. Develop a training and recruiting program to provide the functional expertise required.

3.7.5. Data Base Documentation

Establish data base documentation including a comprehensive data base dictionary which includes:

1. Data element identification
2. Data element usage
3. Data element source
4. Data element relationships
5. Data element ownership
6. Data element volume

3.7.6. System Analysis

A. Collect data on extent of recurring use of files and data elements to identify potential commonality.

B. Perform a detailed analysis of both existing and new applications to determine the anticipated impact and feasibility of the systems being consolidated into an integrated data base system.

3.7.7. Implementation

A. Establish implementation group with responsibility to define performance specs, and monitor implementation. Some of the more important factors to consider are:

1. Storage modes of the data element.
2. Physical/logical storage relationships.
3. Volume and types of storage media supported.
4. Types and response requirements of retrieval devices.
5. Data base security, recovery, and integrity capability.
6. Multiple application data bases.
7. Operation and maintenance functions.
8. Application systems development.
9. Data base installation and testing.
10. Application systems implementation and testing.

B. Implement the ongoing data base organizational changes.

IV

DMS 1100 TECHNICAL PROCEDURES

IV.1

PROCEDURES FOR GENERATING
DMS-1100

1.1. Sample Runstreams

1.2. Building A DMS System

IV.1.1. Sample Runstreams

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December, 1976

Introduction

The purpose of this document is to provide the DMS-1100 user with standard runstreams for constructing a DMS system.

The document is divided into three parts:

Common Bank (CDB) DMR

Segmented DMR

Multiple Common Bank (MCB) DMR

For additional information, consult one of the following documents:

DMS6R1 and 6R1A Release Bulletin

UP-7909 DMS-1100 Systems Support Reference Manual

Construction of CDB DMR

The procedure for constructing a common banked (CDB) DMR is illustrated by Figures 1.1 - 1.2.

The complete runstream appears as Figure 1.1. The runstream is comprised of the following sections:

1. Application of the TCF from the DMS6R1A release tape. The TCF appears as an element named TCF on file 3 of the release tape. The corrections are entered as a TCF and inserted after Line 50 - TCF.TCF. (Reference: Figure 1.1, Lines 61 - 116).

2. Modifications to DMSSGP are inserted after Line 51 - *SGPC. (Reference: Figure 1.1, Lines 51 - 60). Inspect F4.DMSSGP/BASE for the correct line numbers of SGPC to be altered. The example is designed to construct a common banked DMR with TIP=ON, ~~multiple schemas (≤ 5~~) and DBNKST=0145000.

3. Modifications to other elements, if any, are inserted after Line 116. Inspect F3.SGS for the TCF element name entries. Inspect F3.USERSGS for the correct line numbers of the SGS to be altered.

   Observe that the switches for REPON, TIMERON, and ATT appear in USERSGS and are turned on by default. Consequently, users are cautioned against modifying those same switches in DMSSGP, otherwise one can obtain two copies of the REP DMR.

4. The correct BDI - DMR$ for common bank - must be in CERU$ of the system on which the DMS gen is constructed. Additionally the EXEC must be set up with the appropriate REENTRANT card (with options D&Q) to register the common bank.

```
@ELT,L  DMSGEN.DMSGEN
ELT017 RLIB70 01/05-15:03:04-(5,)
000001        001     @RUN,A     DMSGEN,676W76004780,DMS
000002        001     @DELETE,C       F1.
000003        001     @DELETE,C       F2.
000004        001     @DELETE,C       F3.
000005        001     @DELETE,C       F4.
000006        001     @DELETE,C       F5.
000007        001     @DELETE,C       F6.
000008        001     @DELETE,C       F7.
000009        001     @DELETE,C       F8.
000010        001     @DELETE,C       F9.
000011        001     @ASG,CP      F1.,F2///2000
000012        001     @ASG,CP      F2.,F2///2000
000013        001     @ASG,CP      F3.,F2///2000
000014        001     @ASG,CP      F4.,F2///2000
000015        001     @ASG,CP      F5.,F2///2000
000016        001     @ASG,CP      F6.,F2///2000
000017        001     @ASG,CP      F7.,F2///2000
000018        001     @ASG,CP      F8.,F2///2000
000019        001     @ASG,CP      F9.,F2///2000
000020        001     @FREE      F1.
000021        001     @FREE      F2.
000022        001     @FREE      F3.
000023        001     @FREE      F4.
000024        001     @FREE      F5.
000025        001     @FREE      F6.
000026        001     @FREE      F7.
000027        001     @FREE      F8.
000028        001     @FREE      F9.
000029        001     @ASG,A      F1.
000030        001     @ASG,A      F2.
000031        001     @ASG,A      F3.
000032        001     @ASG,A      F4.
000033        001     @ASG,A      F5.
000034        001     @ASG,A      F6.
000035        001     @ASG,A      F7.
000036        001     @ASG,A      F8.
000037        001     @ASG,A      F9.
000038        002     @ASG,T     DMSIN.,U9V,DMSTAP
000039        002     @COPY,G    DMSIN.,F1.
000040        002     @COPY,G    DMSIN.,F2.
000041        002     @COPY,G    DMSIN.,F3.
000042        002     @COPY,G    DMSIN.,F4.
000043        002     @COPY,G    DMSIN.,F5.
000044        002     @COPY,G    DMSIN.,F6.
000045        002     @COPY,G    DMSIN.,F7.
000046        002     @COPY,G    DMSIN.,F8.
000047        002     @COPY,G    DMSIN.,F9.
000048        003     @FREE   DMSIN.
000049        003     @ASG,CP    TCF.,F
000050        003     @ELT,IL     TCF.TCF
000051        003     *SGPC
000052        003     -126,126
000053        003     KDMR         EQU         ON.
000054        003     -147,147
000055        003     TIP         EQU         ON.
000056        003     -175,176
000057        003     PAGLEN       EQU         4500.
000058        005     TIPLEN       EQU         4500.
000059        003     -206,206
000060        003     DBNKST       EQU         0145000
000061        004     *DHOIC
000062        004     -1117/3
000063        004                  TNZ         TRUD15          .     ANY ERROR ?                                6F21
000064        004     *DH52C                                                                              6F21
000065        004     -76,76
000066        004                  TZ          BUT019,X3       .     ANY RUN UNIT QUEUED ?                      6F00
000067        004     *IV02C                                                                              6F00
000068        004     -2239/3,3                                                                           6E68
000069        004                  L,U         R1,5,           .     SET LOOP CONTROL                           6E68
000070        004                  L           A10,('     ')   .     PICK UP SPACES                             6E68
000071        004                  LDSC        A10,6,          .     LEFT JUSTIFY NEXT REEL NUMBER              6E68
000072        004                  TNE         A10,('     ')   .                                                6E68
000073        004                  JGD         R1,$-2          .                                                6E68
000074        004                  .                                                                        6E68
000075        004                  DSC         A10,6           .     NEXT REEL NUMBER IS NOW                    6E68
000076        004                  S           A11,0,X11       .     LEFT JUSTIFIED                             6E68
000077        004     -2555,2555                                                                          6E58
```

Figure 1-1

```
000078   004   -2562/3,3                                                                    6E68
000079   004              S        A10,ATT016,X8   .   SET RP NUMBER INTO SOR BLOCK         6E68
000080   004   -2620                                                                        6E68
000081   004              L        A0,X10          .   POINT A0 AT TSWAP PKT                6E68
000082   004   -2642,2642                                                                   6E68
000083   004              L        A0,(1,IV02FR)   .   FORKS REQUEST PKT                    6E68
000084   004   -2645,2645                                                                   6E68
000085   004              ER       FORK$           .   FORK TO ACTIVITY TO GET              6E68
000086   004              .                            NEXT REEL NUMBER                     6E68
000087   004   -2645/6,7                                                                    6E68
000088   004              L        A10,0,X6        .   PICK UP NEXT REEL NUMBER             6E68
000089   004   -2646/0,3                                                                    6E68
000090   004   -2659                                                                        6E68
000091   004              L        A0,X10          .   POINT A0 AT TSWAP PKT                6E68
000092   004   -2659,2659                                                                   6E68
000093   004              SZ       ATTREL,X6       .   NO REELS BEEN USED YET               6E68
000094   004   *IV05C
000095   004   -122,122                                                                     6F23
000096   004              AX,U     X9,7            .   CORE ADDRESS                         6F23
000097   004   *LINKERC
000098   004   -167                                                                         6E39
000099   004              TE,U     A3,021          .   LOG COMMAND?                         6E39
000100   004              J        LK0122E         .   NO - JUMP LK0122E                    6E39
000101   004              L,S2     A0,0,A1         .   YES - LOAD COMMAND FORMAT            6E39
000102   004              TLE,U    A0,03           .   FORMAT 3 OR 4?                       6E39
000103   004              J        LK0122E         .   NO - JUMP LK0122E                    6E39
000104   004              JGD      R1,LK0122E      .   YES - DLCHEMENT LOOP CONTROL         6E39
000105   004   LK0122E .                                                                    6E39
000106   004   *LONGRECOVERY
000107   004   -32/1                                                                        6A78
000108   004              TZ       DSF017,X10      .   LEAVE RRLNUM ALONE IF ZERO ATTREL    6A78
000109   004   -380,380                                                                     6A78
000110   004              TE,U     A15,0200        .   TIME/DATE STAMP IN A14 ?             6A78
000111   004   -1201,1201                                                                   6A78
000112   004   -1205/0                                                                      6A78
000113   004              L,U      A1,1            .   SET RRLNUM TO ONE IF ZERO ATTREL     6A78
000114   004              TZ       DSF017,X10      .   ZERO ATTREL IN SYSTEM FILE ?         6A78
000115   004   -1206                                                                        6A78
000116   004              S        A0,CRLNUM       .   SET UP CURRENT REEL NUMBER           6A78
000117   004   @EOF
000118   004   @ADD   F3.DMSUP
000119   004   @ASG,T    DMSOUT.,U9V,BLANK
000120   004   @COPY,GM  F1.,DMSOUT.
000121   004   @COPY,GM  F2.,DMSOUT.
000122   004   @COPY,GM  F3.,DMSOUT.
000123   004   @COPY,GM  F4.,DMSOUT.
000124   004   @COPY,GM  F5.,DMSOUT.
000125   004   @COPY,GM  F6.,DMSOUT.
000126   004   @COPY,GM  F7.,DMSOUT.
000127   004   @COPY,GM  F8.,DMSOUT.
000128   004   @COPY,GM  F9.,DMSOUT.
000129   004   @FREE  DMSOUT.
END ELT.

@END
@END IGNORED - IN CONTROL MODE

@BRKPT  PRINTS
```

Figure 1.1 con't.

Construction of Boot Tape

The procedure for constructing a boot tape is illustrated in Figure 1.2.

The DMR must be registered as DMR$ in the SYS$*LIB$ file on the boot tape.

BOOT TAPE RUNSTREAM

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```
@RUN RUNID,XXXXXXXXXXXX,QUAL
@DELETE,C     DMRMT.
@ASG,UP       DMRMT.,F2///5000
@ASG,T        DMSTAPE.,U9V,DMSIN
@MOVE         DMSTAPE.,1
@COPY,G       DMSTAPE.,DMRMT.
@FREE         DMSTAPE.
@ASG,T        OBOOT.,U9V,OBOOT
@ASG,T        NBOOT.,U9V,NBOOT
@COPY,M       OBOOT.,NBOOT.,3
@ASG,T        TEMP.,F40/5/POS/60
@COPIN        OBOOT.,TEMP.
@COPY,A       DMRMT.DMR,TEMP.DMR$
@PACK         TEMP
@PREP         TEMP.
@COPOUT       TEMP.,NBOOT.
@COPY,MN      OBOOT.,NBOOT.,8
@FIN
```

Figure 1.2

Construction of Segmented DMR

The procedure for constructing a segmented DMR is illustrated by Figure 2.1.

The complete runstream appears as Figure 2.1.

The runstream is comprised of the following sections:

1. Modifications to USERSGS are applied as updates to F3.USERSGS and inserted after Line 39 - F3.USERSGS. (Reference: Figure 2.1,Lines 40 - 45). Inspect F3.USERSGS for the correct line numbers of the SGS to be altered.

2. Modifications to DMSSGP are entered as a TCF and inserted after Line 47 - TCF.TCF. (Reference: Figure 2.1, Lines 48 - 71). Inspect F4.DMSSGP/BASE for the correct line numbers of SGPC to be altered.

3. CCF #2503-610-6F27 to IV01 must be applied to correct a problem with the assignment of the segment file when ATT=OFF.

```
@ELT,ICD  TEMP,IN,,END
ELT017 RLIB7  0/04-11150:48-(,0)
000001            @RUN,A    GCG,674W76004780,GASNER
000002      000   @DELETE,C    F1.
000003      000   @DELETE,C    F2.
000004      000   @DELETE,C    F3.
000005      000   @DELETE,C    F4.
000006      000   @DELETE,C    F5.
000007      000   @DELETE,C    F6.
000008      000   @DELETE,C    F7.
000009      000   @DELETE,C    F8.
000010      000   @DELETE,C    F9.
000011      000   @ASG,T     IN.,U4V,47002
000012      000   @DELETE,C    SEGFIL.
000013      000   @DELETE,C    REPSEG.
000014      000   @DELETE,C    F4SEG.
000015      000   @DELETE,C    F5SEG.
000016      000   @ASG,UP     F1.,F2///2000
000017      000   @ASG,UP     F2.,F2///2000
000018      000   @ASG,UP     F3.,F2///2000
000019      000   @ASG,UP     F4.,F2///2000
000020      000   @ASG,UP     F5.,F2///2000
000021      000   @ASG,UP     F6.,F2///2000
000022      000   @ASG,UP     F7.,F2///2000
000023      000   @ASG,UP     F8.,F2///2000
000024      000   @ASG,UP     F9.,F2///2000
000025      000   @ASG,UP     SEGFIL.,F2///100
000026      000   @ASG,UP     REPSEG.,F2///100
000027      000   @ASG,UP     F4SEG.,F2///2000
000028      000   @ASG,UP     F5SEG.,F2///2000
000029      000   @COPY,G     IN.,F1.
000030      000   @COPY,G     IN.,F2.
000031      000   @COPY,G     IN.,F3.
000032      000   @COPY,G     IN.,F4.
000033      000   @COPY,G     IN.,F5.
000034      000   @COPY,G     IN.,F6.
000035      000   @COPY,G     IN.,F7.
000036      000   @COPY,G     IN.,F8.
000037      000   @COPY,G     IN.,F9.
000038      000   @FREE    IN.
000039      000   @ELT,UL    F3.USERSGS
000040      000   -1
000041      000   SEGMENT             DMR, STATISTICS
000042      000   DMRSEGMENTFILE SEGFIL
000043      000   REPSEGMENTFILE REPSEG
000044      000   SEGDMR              F4SEG
000045      000   SEGREPF             F5SEG
000046      000   @ASG,T    TCF.,F2
000047      000   @ELT,IL    TCF.TCF
000048      000   .SGPC
000049      000   -77,77
000050      000   AUTORP      EQU          ON
000051      000   -85,85
000052      000   CKP16       EQU          ON
000053      000   -107,107
000054      000   ONESCH      EQU          OFF
000055      000   -112,112
000056      000   SDP         EQU          ON
000057      000   -126,126
000058      000   KDMR        EQU          ON
000059      000   -143,143
000060      000   SEG         EQU          ON.
000061      000   -147,147
000062      000   TIP         EQU          OFF
000063      000   -168,168
000064      000   SCLLEN      EQU          5
000065      000   -169,169
000066      000   SSLLEN      EQU          5.        LENGTH OF SUBSCHEMA REF. TABLE LIST
000067      000   -175,176
000068      000   PAGLEN      EQU          4500
000069      000   TIPLEN      EQU          4500
000070      000   -206,206
000071      000   DBNKST      EQU          0145000
000072      000   @EOF
000073      000   @ADD,P    F3.DMSUP
000074      000   @ASG,T    OUT.,U4V,42849
000075      000   @COPY,GM    F1.,OUT.
000076      000   @COPY,GM    F2.,OUT.
000077      000   @COPY,GM    F3.,OUT.
```

٢٢.١-٩

Figure 2.1

```
000078      000   @COPY,GM   F4SEG.,OUT.
000079      000   @COPY,GM   F5SEG.,OUT.
000080      000   @COPY,GM   F6.,OUT.
000081      000   @COPY,GM   F7.,OUT.
000082      000   @COPY,GM   F8.,OUT.
000083      000   @COPY,GM   F9.,OUT.
000084      000   @COPY,GM   SEGFIL.,OUT.
000085      000   @COPY,GM   AFPSEG.,OUT.

END ELT.

@FIN
```

Figure 2.1 con't.

Construction of the Boot Tape

The procedures for constructing a boot tape is similar to that of a CDB DMR.

The absolute from F2 on the generated segmented DMR output tape must be copied onto the SYS$*LIB$ file on the boot tape.

```
@COPY,A   DMRMT.DMR,SYS$*LIB$.DMR$
```

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Construction of MCB DMR

The procedure for constructing a MCB DMR is illustrated by Figures 3.1 - 3.3.

The complete runstream appears as Figure 3.1. The runstream is comprised of the following sections:

1. Modifications to DMSSGP are inserted after Line 37 - *SGPC. (Reference: Section 1 for additional details on DMSSGP parameters).

2. Modifications to USERSGS are inserted after Line 38 - *USERSGSC (Reference: Figure 3.1, Lines 30 - 51). The example is designed to generate a BDL system wherein DMR1$ - DMR5$ represent the BDI's for the five banks and the PMD options are specified for the four I-banks and the PM option is specified for the D-bank.

3. F3.DMSUP was @ADD'ed to effect the map symbolics in F5.MBMAP. (Reference: Figure 3.2). Observe that the V-option has been added by the generation mechanism to the stripped banks.

4. Modifications must be made to F5.MBMAP to correct the map options. (Reference: Figure 3.1, Lines 54 - 103). Figure 3.3 illustrates the contents of F5.MBMAP after the modifications. Observe that the object bank contains the M-option while the stripped banks contain the DV-option.

5. The revised map symbolics F5.MBMAP must be @ADD'ed to effect a remapping of the five common banks.

6. The correct BDI's - DMR1$, DMR2$, DMR3$, DMR4$, and DMR5$ for the multiple common banks - must be in CERU$ of the system on which the DMS gen is constructed. Additionally, the EXEC must be set up with the appropriate REENTRANT cards (with options D&Q) to register the common banks.

```
@ELT,ILD   DMSGEN.IN,,END
ELT017 RLIB70 09/29-11:49:54-(,0)
000001        000    @RUN    DMSGEN,674W76009780,DMS
000002        000    @ASG,T    TAP.,U9V,91862
000003        000    @DELETE,C    TCF.
000004        000    @DELETE,C   F1.
000005        000    @DELETE,C   F2.
000006        000    @DELETE,C F3.
000007        000    @DELETE,C F4.
000008        000    @DELETE,C F5.
000009        000    @DELETE,C F6.
000010        000    @DELETE,C F7.
000011        000    @DELETE,C F8.
000012        000    @DELETE,C F9.
000013        000    @DELETE,C     F10.
000014        000    @ASG,UP      F1.,F2///2000
000015        000    @ASG,UP      F2.,F2///2000
000016        000    @ASG,UP F3.,F2///2000
000017        000    @ASG,UP F4.,F2///2000
000018        000    @ASG,UP F5.,F2///2000
000019        000    @ASG,UP F6.,F2///2000
000020        000    @ASG,UP F7.,F2///2000
000021        000    @ASG,UP F8.,F2///2000
000022        000    @ASG,UP F9.,F2///2000
000023        000    @ASG,UP      F10.,F2///2000
000024        000    @COPY,G   TAP.,F1.
000025        000    @COPY,G    TAP.,F2.
000026        000    @COPY,G    TAP.,F3.
000027        000    @COPY,G    TAP.,F4.
000028        000    @COPY,G    TAP.,F5.
000029        000    @COPY,G    TAP.,F6.
000030        000    @COPY,G    TAP.,F7.
000031        000    @COPY,G    TAP.,F8.
000032        000    @COPY,G    TA".,F9.
000033        000    @COPY,G    TA'.,F10.
000034        000    @FREE      TAP.
000035        000    @ASG,T     TCF.F
000036        000    @ELT,DIL   TCF.TCF
000037        000    *SGPC
000038        000    *USERSGSC
000039        000    -11
000040        000    MULTIBANK BDL.
000041        000    -12,12
000042        000    CONTROLBANK CONTRL,DMR1S,PMD IV01,IV02,IV03,IV04,TH01,TH02,TH03,TH05,I
000043        000    -16,16
000044        000    BANK BANK01,DMR2S,PMD IV05,IV06,IV07,IV08,IV09,TC01,TC04,TC06,I
000045        000    -19,19
000046        000    BANK BANK02,DMR3S,PMD DC21,DH04,DH08,DH10,DH11,DH12,DH13,DH18,DH19,I
000047        000    -22,22
000048        000    BANK BANK03,DMR4S,PMD DC02,DC0301,DC0302,DC0303,DC0305,I
000049        000    -26,26
000050        000    DMRBUF DMRBUF,DMR5S,PM
000051        000    @END
000052        000    @ADD,P  F3.DMSUP
000053        000    @ELT,L    F5.MBMAP
000054        000    @ELT,UL     F5.MBMAP
000055        000    -4,4-
000056        000    /PMD/PM/
000057        000    -6,6-
000058        000    /PMDV/PDV/
000059        000    -8,8-
000060        000    /PMDV/PDV/
000061        000    -10,10-
000062        000    /PMDV/PDV/
000063        000    -12,12-
000064        000    /PMV/PDV/
000065        000    -17,17-
000066        000    /PMDV/PDV/
000067        000    -19,19-
000068        000    /PMD/PM/
000069        000    -21,21-
000070        000    /PMDV/PDV/
000071        000    -23,23-
000072        000    /PMDV/PDV/
000073        000    -25,25-
000074        000    /PMV/PDV/
000075        000    -30,30-
000076        000    /PMDV/PDV/
000077        000    -32,32-
```

Figure 3.1

```
000078        000    /PMDV/PDV/
000079        000    -34,34-
000080        000    /PMD/PM/
000081        000    -36,36-
000082        000    /PMDV/PDV/
000083        000    -38,38-
000084        000    /PMV/PDV/
000085        000    -43,43-
000086        000    /PMDV/PDV/
000087        000    -45,45-
000088        000    /PMDV/PDV/
000089        000    -47,47-
000090        000    /PMDV/PDV/
000091        000    -49,49-
000092        000    /PMD/PM/
000093        000    -51,51-
000094        000    /PMV/PDV/
000095        000    -56,56-
000096        000    /PMDV/PDV/
000097        000    -58,58-
000098        000    /PMDV/PDV/
000099        000    -60,60-
000100        000    /PMDV/PDV/
000101        000    -62,62-
000102        000    /PMDV/PDV/
000103        000    @END
000104        000    @ADD,P     F5,MBMAP
000105        000    @ASG,T     OUT.,U9V,96900
000106        000    @COPY,MG    F1.,OUT.
000107        000    @COPY,MG    F2.,OUT.
000108        000    @COPY,MG    F3.,OUT.
000109        000    @COPY,MG    F4.,OUT.
000110        000    @COPY,MG    F5.,OUT.
000111        000    @COPY,MG    F6.,OUT.
000112        000    @COPY,MG    F7.,OUT.
000113        000    @COPY,MG    F8.,OUT.
000114        000    @COPY,MG    F9.,OUT.
000115        000    @COPY,GM     F10.,OUT.
END ELT.

@FIN
```

Figure 3.1 con't.

```
@ELT,L   FS.MDMAP.
ELT017 RLIB70 09/27-12:48:21-(0,)
000001         000    @HDG      *** CONTRL MAP  ***
000002         000    @MSG      *** CONTRL MAP  ***
000003         000    @MAP,IL    ,XXX.CONTRL
000004         000    IBANK,PMD        CONTRL,01000
000005         000    @ADD,P    XXX.CONTRL
000006         000    IBANK,PMDV            BANK01,(CONTRL)
000007         000    @ADD,P    XXX.BANK01
000008         000    IBANK,PMDV            BANK02,(CONTRL)
000009         000    @ADD,P    XXX.BANK02
000010         000    IBANK,PMDV            BANK03,(CONTRL)
000011         000    @ADD,P    XXX.BANK03
000012         000    DBANK,PMV             DMRBUF
000013         000    @ADD,P    XXX.DMRBUF
000014         000    @HDG      *** BANK01 MAP  ***
000015         000    @MSG      *** BANK01 MAP  ***
000016         000    @MAP,IL    ,XXX.BANK01
000017         000    IBANK,PMDV       CONTRL,01000
000018         000    @ADD,P    XXX.CONTRL
000019         000    IBANK,PMD             BANK01,(CONTRL)
000020         000    @ADD,P    XXX.BANK01
000021         000    IBANK,PMDV            BANK02,(CONTRL)
000022         000    @ADD,P    XXX.BANK02
000023         000    IBANK,PMDV            BANK03,(CONTRL)
000024         000    @ADD,P    XXX.BANK03
000025         000    DBANK,PMV             DMRBUF
000026         000    @ADD,P    XXX.DMRBUF
000027         000    @HDG      *** BANK02 MAP  ***
000028         000    @MSG      *** BANK02 MAP  ***
000029         000    @MAP,IL    ,XXX.BANK02
000030         000    IBANK,PMDV       CONTRL,01000
000031         000    @ADD,P    XXX.CONTRL
000032         000    IBANK,PMDV            BANK01,(CONTRL)
000033         000    @ADD,P    XXX.BANK01
000034         000    IBANK,PMD             BANK02,(CONTRL)
000035         000    @ADD,P    XXX.BANK02
000036         000    IBANK,PMDV            BANK03,(CONTRL)
000037         000    @ADD,P    XXX.BANK03
000038         000    DBANK,PMV             DMRBUF
000039         000    @ADD,P    XXX.DMRBUF
000040         000    @HDG      *** BANK03 MAP  ***
000041         000    @MSG      *** BANK03 MAP  ***
000042         000    @MAP,IL    ,XXX.BANK03
000043         000    IBANK,PMDV       CONTRL,01000
000044         000    @ADD,P    XXX.CONTRL
000045         000    IBANK,PMDV            BANK01,(CONTRL)
000046         000    @ADD,P    XXX.BANK01
000047         000    IBANK,PMDV            BANK02,(CONTRL)
000048         000    @ADD,P    XXX.BANK02
000049         000    IBANK,PMD             BANK03,(CONTRL)
000050         000    @ADD,P    XXX.BANK03
000051         000    DBANK,PMV             DMRBUF
000052         000    @ADD,P    XXX.DMRBUF
000053         000    @HDG      *** DMRBUF MAP  ***
000054         000    @MSG      *** DMRBUF MAP  ***
000055         000    @MAP,IL    ,XXX.DMRBUF
000056         000    IBANK,PMDV       CONTRL,01000
000057         000    @ADD,P    XXX.CONTRL
000058         000    IBANK,PMDV            BANK01,(CONTRL)
000059         000    @ADD,P    XXX.BANK01
000060         000    IBANK,PMDV            BANK02,(CONTRL)
000061         000    @ADD,P    XXX.BANK02
000062         000    IBANK,PMDV            BANK03,(CONTRL)
000063         000    @ADD,P    XXX.BANK03
000064         000    DBANK,PM              DMRBUF
000065         000    @ADD,P    XXX.DMRBUF

END ELT.

@FIN
```

Figure 3.2

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```
@ELT,UL   F5.MAMAP
ELT001  RLIB70 09/29-11:40:20-(0,1)
000001         000     WHDG      *** CONTRL MAP  ***
000002         000     WHSG      *** CONTRL MAP  ***
000003         000     WMAP,IL    ,XXX.CONTRL
000004   NEW   001     IBANK,PH          CONTRL,01000
000005   -01   000     GADD,P    XXX.CONTRL
000006   NEW   001     IBANK,PDV            BANK01,(CONTRL)
000007   -01   000     GADD,P    XXX.BANK01
000008   NEW   001     IBANK,PDV            BANK02,(CONTRL)
000009   -01   000     GADD,P    XXX.BANK02
000010   NEW   001     IBANK,PDV            BANK03,(CONTRL)
000011   -01   000     GADD,P    XXX.BANK03
000012   NEW   001     DBANK,PDV            DYNBUF
000013   -01   000     GADD,P    XXX.DYNBUF
000014         000     WHDG      *** BANK01 MAP  ***
000015         000     WHSG      *** BANK01 MAP  ***
000016         000     WMAP,IL    ,XXX.BANK01
000017   NEW   001     IBANK,PDV         CONTRL,01000
000018   -01   000     GADD,P    XXX.CONTRL
000019   NEW   001     IBANK,PH             BANK01,(CONTRL)
000020   -01   000     GADD,P    XXX.BANK01
000021   NEW   001     IBANK,PDV            BANK02,(CONTRL)
000022   -01   000     GADD,P    XXX.BANK02
000023   NEW   001     IBANK,PDV            BANK03,(CONTRL)
000024   -01   000     GADD,P    XXX.BANK03
000025   NEW   001     DBANK,PDV            DYNBUF
000026   -01   000     GADD,P    XXX.DYNBUF
000027         000     WHDG      *** BANK02 MAP  ***
000028         000     WHSG      *** BANK02 MAP  ***
000029         000     WMAP,IL    ,XXX.BANK02
000030   NEW   001     IBANK,PDV         CONTRL,01000
000031   -01   000     GADD,P    XXX.CONTRL
000032   NEW   001     IBANK,PDV            BANK01,(CONTRL)
000033   -01   000     GADD,P    XXX.BANK01
000034   NEW   001     IBANK,PH             BANK02,(CONTRL)
000035   -01   000     GADD,P    XXX.BANK02
000036   NEW   001     IBANK,PDV            BANK03,(CONTRL)
000037   -01   000     GADD,P    XXX.BANK03
000038   NEW   001     DBANK,PDV            DYNBUF
000039   -01   000     GADD,P    XXX.DYNBUF
000040         000     WHDG      *** BANK03 MAP  ***
000041         000     WHSG      *** BANK03 MAP  ***
000042         000     WMAP,IL    ,XXX.BANK03
000043   NEW   001     IBANK,PDV         CONTRL,01000
000044   -01   000     GADD,P    XXX.CONTRL
000045   NEW   001     IBANK,PDV            BANK01,(CONTRL)
000046   -01   000     GADD,P    XXX.BANK01
000047   NEW   001     IBANK,PDV            BANK02,(CONTRL)
000048   -01   000     GADD,P    XXX.BANK02
000049   NEW   001     IBANK,PH             BANK03,(CONTRL)
000050   -01   000     GADD,P    XXX.BANK03
000051   NEW   001     DBANK,PDV            DYNBUF
000052   -01   000     GADD,P    XXX.DYNBUF
000053         000     WHDG      *** DYNBUF MAP  ***
000054         000     WHSG      *** DYNBUF MAP  ***
000055         000     WMAP,IL    ,XXX.DYNBUF
000056   NEW   001     IBANK,PDV         CONTRL,01000
000057   -01   000     GADD,P    XXX.CONTRL
000058   NEW   001     IBANK,PDV            BANK01,(CONTRL)
000059   -01   000     GADD,P    XXX.BANK01
000060   NEW   001     IBANK,PDV            BANK02,(CONTRL)
000061   -01   000     GADD,P    XXX.BANK02
000062   NEW   001     IBANK,PDV            BANK03,(CONTRL)
000063   -01   000     GADD,P    XXX.BANK03
000064         000     DBANK,PH             DYNBUF
000065         000     GADD,P    XXX.DYNBUF
END ELT.

@END
@END IGNORED - IN CONTROL MODE

@USE    555.,F1

@USE    YYY.,F2
```

Figure 3.3

Construction of Boot Tape

The procedure for constructing a boot tape is similar to that of a CDB DMR, with the exception that F5 is to be used.

The absolute from F5 of the generated CMB DMR output tape must be copied onto the SYS$*LIB$ file on the boot tape.

```
    @COPY,A    F5.CONTRL,SYS$*LIB$.DMR1$
    @COPY,A    F5.BANK01,SYS$*LIB$.DMR2$
    @COPY,A    F5.BANK02,SYS$*LIB$.DMR3$
    @COPY,A    F5.BANK03,SYS$*LIB$.DMR4$
    @COPY,A    F5.DMRBUF,SYS$*LIB$.DMR5$
```

Appendix A: DMS Tape File Description

```
WPRT,TL F1.
FURPUR 27R2  RL72R1 10/04/76 11:58:42

LEE*F1(1)   ELEMENT TABLE

D  NAME          VERSION         TYPE          DATE        TIME      SEQ #  SIZE-PRE,TEXT (CYCLE WORD) PSRMODE  LOCATION
   CLSEGS                        RELOCATABLE   09 MAR 72   16:40:17     1       1      0                          1792
   RDUMP                         RELOCATABLE   28 MAR 73   10:40:02     2       1      5                          1793
   DUMP                          ABSOLUTE      28 MAR 73   10:40:06     3             33                          1799
   AID                           ABSOLUTE      12 FEB 75   10:02:07     4            424                          1832
   SORTBUF                       RELOCATABLE   05 NOV 75   17:02:57     5       1      7                          2256
   DDL                           ABSOLUTE      20 JUL 76   19:15:53     6            850                          2264
   DMLP                          ABSOLUTE      20 JUL 76   19:18:15     7            725                          3114
   L$INKR                        RELOCATABLE   20 JUL 76   19:22:04     8       3      9                          3839
   LINKER                        RELOCATABLE   26 AUG 76   22:23:11     9       4     25                          3851
   DMR                           RELOCATABLE   27 AUG 76   11:14:31    10       3   2076                          3880
   ADMLP                         ABSOLUTE      28 SEP 76   04:24:46    11            853                          5959
   FSSP                          OMNIBUS       28 SEP 76   05:02:26    12            846                          6812
   FDMLP                         OMNIBUS       28 SEP 76   05:04:13    13            756                          7658
   LNK                           RELOCATABLE   28 SEP 76   05:04:45    14      12     11                          8419
   MDPDBK                        OMNIBUS       28 SEP 76   05:05:24    15            927                          8437
   FSSP                          ABSOLUTE      28 SEP 76   05:05:58    16            834                 QTR      9364
   FDMLP                         ABSOLUTE      28 SEP 76   05:06:38    17            834                 QTR     10198
NEXT AVAILABLE LOCATION=                                                                                       11032

ASSEMBLER PROCEDURE TABLE EMPTY

COBOL PROCEDURE TABLE EMPTY

FORTRAN PROCEDURE TABLE EMPTY

ENTRY POINT TABLE EMPTY

@PRT,TL F2.

LEE*F2(1)   ELEMENT TABLE

D  NAME          VERSION         TYPE          DATE        TIME      SEQ #  SIZE-PRE,TEXT (CYCLE WORD) PSRMODE  LOCATION
   CLSEGS                        RELOCATABLE   09 MAR 72   16:40:17     1       1      0                          1792
   CHGUNITS                      ELT SYMB      11 JAN 73   20:51:57     2              1     5   0   1            1793
   RDUMP                         RELOCATABLE   28 MAR 73   10:40:02     3       1      5                          1794
   DUMP                          ABSOLUTE      28 MAR 73   10:40:06     4             33                          1800
   TIMLT                         ELT SYMB      01 APR 73   12:37:41     5              1     5   0   1            1833
   DMRCLEAR                      ELT SYMB      15 APR 74   19:58:56     6              1     5   0   1            1834
   SORTBUF                       RELOCATABLE   05 NOV 75   17:02:57     7       1      7                          1835
   DDL                           ABSOLUTE      20 JUL 76   19:15:53     8            850                          1843
   DMLP                          ABSOLUTE      20 JUL 76   19:18:15     9            725                          2693
   L$INKR                        RELOCATABLE   20 JUL 76   21:05:44    10       3      9                          3418
   TIMER                         ABSOLUTE      20 JUL 76   21:27:27    11             25                          3430
   QLINIT                        ABSOLUTE      20 JUL 76   21:27:59    12             19                          3455
   DTBSDMP1                      ABSOLUTE      20 JUL 76   21:29:21    13             25                          3474
   DTBSDMP2                      ABSOLUTE      20 JUL 76   21:29:51    14             12                          3499
   DYNDUMP                       ABSOLUTE      20 JUL 76   21:30:23    15             11                          3511
   QUIREC                        ABSOLUTE      20 JUL 76   21:31:01    16              9                          3522
   DMRACT                        ABSOLUTE      20 JUL 76   21:31:35    17             10                          3531
   UPDATE                        ABSOLUTE      20 JUL 76   21:32:10    18             16                          3541
   DMRCLR                        ABSOLUTE      20 JUL 76   21:32:45    19              9                          3557
   CHECKPOINT                    ABSOLUTE      20 JUL 76   21:35:11    20             10                          3566
   TIPCOPY                       ABSOLUTE      20 JUL 76   21:35:46    21             12                          3576
   LONGRECOVERY                  ABSOLUTE      09 AUG 76   09:22:57    22            138                          3588
   SFINIT                        ABSOLUTE      09 AUG 76   09:27:31    23            439                          3726
   LINKER                        RELOCATABLE   26 AUG 76   22:29:53    24       4     24                          4165
   DMR                           ABSOLUTE      27 AUG 76   13:40:30    25           1735                          4193
   ADMLP                         ABSOLUTE      28 SEP 76   04:24:46    26            853                          5928
   FSSP                          OMNIBUS       28 SEP 76   05:02:26    27            846                          6781
   FDMLP                         OMNIBUS       28 SEP 76   05:04:13    28            756                          7627
   LNK                           RELOCATABLE   28 SEP 76   05:04:45    29      12     11                          8383
   MDPDBK                        OMNIBUS       28 SEP 76   05:05:24    30            927                          8406
   FSSP                          ABSOLUTE      28 SEP 76   05:05:58    31            834                 QTR      9333
   FDMLP                         ABSOLUTE      28 SEP 76   05:06:38    32            834                 QTR     10167
NEXT AVAILABLE LOCATION=                                                                                       11001

ASSEMBLER PROCEDURE TABLE EMPTY

COBOL PROCEDURE TABLE EMPTY

FORTRAN PROCEDURE TABLE EMPTY
```

```
ENTRY POINT TABLE EMPTY

@PRT,TL F3.

LEE*F3(1)   ELEMENT TABLE

D  NAME          VERSION       TYPE       DATE        TIME      SEQ #  SIZE-PRE,TEXT (CYCLE WORD) PSRMODE  LOCATION
   FORC                       ELT SYMB   07 JUN 72   01:28:44     1              1     5    0   1              1792
   DMRC                       ELT SYMB   07 JUN 72   01:29:46     2              1     5    0   1              1793
   LIST                       ELT SYMB   29 JUN 72   00:10:10     3             51     5    7   5              1794
   COPY                       ELT SYMB   06 JUL 72   03:33:43     4              4     5    5   5              1845
   DMRTEM?                    ELT SYMB   08 AUG 72   10:07:03     5             31     5   15   5              1849
   RELSTAPE                   ELT SYMB   17 APR 74   17:17:58     6              2     5    0   1              1880
   DMSUP                      ELT SYMB   04 JUN 75   19:53:59     7              8     5    2   3              1882
   DMSUP         NOPCF        ELT SYMB   04 JUN 75   19:54:00     8              5     5    0   1              1890
   UTMAPSEGR     BASE         ELT SYMB   04 AUG 75   08:54:19     9              1     5    0   1              1895
   UTMAPSEGA     BASE         ELT SYMB   04 AUG 75   08:55:00    10              1     5    0   1              1896
   IV04C                      ELT SYMB   06 SEP 75   08:40:49    11              1     5    0   1              1897
   TC04C                      ELT SYMB   06 SEP 75   08:44:17    12              1     5    0   1              1898
   TC06C                      ELT SYMB   06 SEP 75   08:44:43    13              1     5    0   1              1899
   TC14C                      ELT SYMB   06 SEP 75   08:46:54    14              1     5    0   1              1900
   TC16C                      ELT SYMB   06 SEP 75   08:48:14    15              1     5    0   1              1901
   DC0301C                    ELT SYMB   06 SEP 75   08:50:29    16              1     5    0   1              1902
   DC0302C                    ELT SYMB   06 SEP 75   08:50:50    17              1     5    0   1              1903
   DC0306C                    ELT SYMB   06 SEP 75   08:52:39    18              1     5    0   1              1904
   DC14C                      ELT SYMB   06 SEP 75   08:57:20    19              1     5    0   1              1905
   DC21C                      ELT SYMB   06 SEP 75   08:58:09    20              1     5    0   1              1906
   TH01C                      ELT SYMB   06 SEP 75   08:58:24    21              1     5    0   1              1907
   TH08C                      ELT SYMB   06 SEP 75   09:02:33    22              1     5    0   1              1908
   TH12C                      ELT SYMB   06 SEP 75   09:03:44    23              1     5    0   1              1909
   TH15C                      ELT SYMB   06 SEP 75   09:04:32    24              1     5    0   1              1910
   TH20C                      ELT SYMB   06 SEP 75   09:05:21    25              1     5    0   1              1911
   DH03C                      ELT SYMB   06 SEP 75   09:06:43    26              1     5    0   1              1912
   DH05C                      ELT SYMB   06 SEP 75   09:07:35    27              1     5    0   1              1913
   DH07C                      ELT SYMB   06 SEP 75   09:08:03    28              1     5    0   1              1914
   DH12C                      ELT SYMB   06 SEP 75   09:10:56    29              1     5    0   1              1915
   DH14C                      ELT SYMB   06 SEP 75   09:12:03    30              1     5    0   1              1916
   DH21C                      ELT SYMB   06 SEP 75   09:15:33    31              1     5    0   1              1917
   DH22C                      ELT SYMB   06 SEP 75   09:15:57    32              1     5    0   1              1918
   DH31C                      ELT SYMB   06 SEP 75   09:21:02    33              1     5    0   1              1919
   DH34C                      ELT SYMB   06 SEP 75   09:21:27    34              1     5    0   1              1920
   DH35C                      ELT SYMB   06 SEP 75   09:21:53    35              1     5    0   1              1921
   DH47C                      ELT SYMB   06 SEP 75   09:29:14    36              1     5    0   1              1922
   DH50C                      ELT SYMB   06 SEP 75   09:29:48    37              1     5    0   1              1923
   DH51C                      ELT SYMB   06 SEP 75   09:30:20    38              1     5    0   1              1924
   CA03C                      ELT SYMB   06 SEP 75   09:31:55    39              1     5    0   1              1925
   CA04C                      ELT SYMB   06 SEP 75   09:32:11    40              1     5    0   1              1926
   I005C                      ELT SYMB   06 SEP 75   09:33:36    41              1     5    0   1              1927
   UT02C                      ELT SYMB   06 SEP 75   09:35:42    42              1     5    0   1              1928
   UT04C                      ELT SYMB   06 SEP 75   09:36:36    43              1     5    0   1              1929
   GS09C                      ELT SYMB   06 SEP 75   09:39:39    44              1     5    0   1              1930
   GS10C                      ELT SYMB   06 SEP 75   09:40:01    45              1     5    0   1              1931
   SKEL          BASE         ELT SYMB   26 SEP 75   16:28:15    46            359     5    0   1              1932
   SGS.          BASE         ELT SYMB   26 SEP 75   16:28:25    47            269     5    0   1              2291
   D L-MAPC                   ELT SYMB   26 SEP 75   16:28:29    48              1     5    0   1              2560
   DMLMAPC                    ELT SYMB   26 SEP 75   16:28:29    49              1     5    0   1              2561
   ADMLPMAPC                  ELT SYMB   26 SEP 75   16:28:35    50              1     5    0   1              2562
   DMUCOPYC                   ELT SYMB   26 SEP 75   16:28:56    51              1     5    0   1              2563
   MAINC                      ELT SYMB   26 SEP 76   16:28:57    52              1     5    0   1              2564
   MAIN-ASCIIC                ELT SYMB   26 SEP 75   16:29:04    53              1     5    0   1              2565
   DMRDEFC                    ELT SYMB   26 SEP 75   16:29:04    54              1     5    0   1              2566
   TABPLSC                    ELT SYMB   26 SEP 75   16:29:21    55              1     5    0   1              2567
   DSWPLSC                    ELT SYMB   26 SEP 75   16:29:30    56              1     5    0   1              2568
   UTBPLSC                    ELT SYMB   26 SEP 75   16:29:35    57              1     5    0   1              2569
   ACOPC                      ELT SYMB   26 SEP 75   16:30:01    58              1     5    0   1              2570
   UTBC                       ELT SYMB   26 SEP 75   16:30:13    59              1     5    0   1              2571
   RFSC                       ELT SYMB   26 SEP 75   16:31:05    60              1     5    0   1              2572
   COPC                       ELT SYMB   26 SEP 75   16:31:12    61              1     5    0   1              2573
   DDLPC                      ELT SYMB   26 SEP 75   16:32:58    62              1     5    0   1              2574
   FILC                       ELT SYMB   26 SEP 75   16:33:11    63              1     5    0   1              2575
   RFPSC                      ELT SYMB   26 SEP 75   16:33:23    64              1     5    0   1              2576
   IMAC                       ELT SYMB   26 SEP 75   16:37:39    65              1     5    0   1              2577
   LEXC                       ELT SYMB   26 SEP 75   16:38:01    66              1     5    0   1              2578
   STUC                       ELT SYMB   26 SEP 75   16:38:13    67              1     5    0   1              2579
   SYNC                       ELT SYMB   26 SEP 75   16:39:00    68              1     5    0   1              2580
   NMLC                       ELT SYMB   26 SEP 75   16:43:09    69              1     5    0   1              2581
   DRMC                       ELT SYMB   26 SEP 75   16:43:14    70              1     5    0   1              2582
   ITRC                       ELT SYMB   26 SEP 75   16:43:21    71              1     5    0   1              2583
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ITWC            ELT  SYMB   26 SEP 75   16:43:26    72   |  5  0  |   2584
INCC            ELT  SYMB   26 SEP 75   16:43:33    73   |  5  0  |   2585
NAMC            ELT  SYMB   26 SEP 75   16:43:39    74   |  5  0  |   2586
NLIC            ELT  SYMB   26 SEP 75   16:43:46    75   |  5  0  |   2587
PRCC            ELT  SYMB   26 SEP 75   16:44:13    76   |  5  0  |   2588
DMLC            ELT  SYMB   26 SEP 75   16:44:20    77   |  5  0  |   2589
CONC            ELT  SYMB   26 SEP 75   16:44:34    78   |  5  0  |   2590
COOC            ELT  SYMB   26 SEP 75   16:44:39    79   |  5  0  |   2591
DATC            ELT  SYMB   26 SEP 75   16:44:46    80   |  5  0  |   2592
DCMC            ELT  SYMB   26 SEP 75   16:44:58    81   |  5  0  |   2593
IEDC            ELT  SYMB   26 SEP 75   16:45:26    82   |  5  0  |   [illegible]
LVEC            ELT  SYMB   26 SEP 75   16:46:03    83   |  5  0  |   2595
PDMC            ELT  SYMB   26 SEP 75   16:46:52    84   |  5  0  |   2596
PDOC            ELT  SYMB   26 SEP 75   16:46:56    85   |  5  0  |   2597
PGMC            ELT  SYMB   26 SEP 75   16:47:03    86   |  5  0  |   2598
PHAC            ELT  SYMB   26 SEP 75   16:47:10    87   |  5  0  |   2599
PICC            ELT  SYMB   26 SEP 75   16:47:15    88   |  5  0  |   2600
PROC            ELT  SYMB   26 SEP 75   16:47:24    89   |  5  0  |   2601
RECC            ELT  SYMB   26 SEP 75   16:47:32    90   |  5  0  |   2602
REFC            ELT  SYMB   26 SEP 75   16:47:42    91   |  5  0  |   2603
RELC            ELT  SYMB   26 SEP 75   16:47:49    92   |  5  0  |   2604
LEXXC           ELT  SYMB   26 SEP 75   16:48:01    93   |  5  0  |   2605
ANNLC           ELT  SYMB   26 SEP 75   16:48:49    94   |  5  0  |   2606
ADRMC           ELT  SYMB   26 SEP 75   16:48:54    95   |  5  0  |   2607
AITRC           ELT  SYMB   26 SEP 75   16:49:01    96   |  5  0  |   2608
AITWC           ELT  SYMB   26 SEP 75   16:49:03    97   |  5  0  |   2609
AINCC           ELT  SYMB   26 SEP 75   16:49:15    98   |  5  0  |   2610
ANAMC           ELT  SYMB   26 SEP 75   16:49:21    99   |  5  0  |   2611
ADMLC           ELT  SYMB   26 SEP 75   16:50:13   100   |  5  0  |   2612
ACOOC           ELT  SYMB   26 SEP 75   16:50:19   101   |  5  0  |   2613
ADATC           ELT  SYMB   26 SEP 75   16:50:28   102   |  5  0  |   2614
ADGEC           ELT  SYMB   26 SEP 75   16:51:05   103   |  5  0  |   2615
AIEDC           ELT  SYMB   26 SEP 75   16:51:18   104   |  5  0  |   2616
AINVC           ELT  SYMB   26 SEP 75   16:51:44   105   |  5  0  |   2617
ALVEC           ELT  SYMB   26 SEP 75   16:52:06   106   |  5  0  |   2618
APDOC           ELT  SYMB   26 SEP 75   16:53:24   107   |  5  0  |   2619
APGMC           ELT  SYMB   26 SEP 75   16:53:31   108   |  5  0  |   2620
APHAC           ELT  SYMB   26 SEP 75   16:53:42   109   |  5  0  |   2621
APROC           ELT  SYMB   26 SEP 75   16:53:56   110   |  5  0  |   2622
AREFC           ELT  SYMB   26 SEP 75   16:54:15   111   |  5  0  |   2623
ASNMC           ELT  SYMB   26 SEP 75   16:54:57   112   |  5  0  |   2624
AREAC           ELT  SYMB   26 SEP 75   16:56:19   113   |  5  0  |   2625
CDC             ELT  SYMB   26 SEP 75   16:56:27   114   |  5  0  |   2626
CERRC           ELT  SYMB   26 SEP 75   16:56:41   115   |  5  0  |   2627
CODEC           ELT  SYMB   26 SEP 75   16:57:26   116   |  5  0  |   2628
CPC             ELT  SYMB   26 SEP 75   16:57:32   117   |  5  0  |   2629
IMAGEC          ELT  SYMB   26 SEP 75   16:58:45   118   |  5  0  |   2630
SYNTAXC         ELT  SYMB   26 SEP 75   16:59:23   119   |  5  0  |   2631
INITIALIZEC     ELT  SYMB   26 SEP 75   17:00:10   120   |  5  0  |   2632
LEXICONC        ELT  SYMB   26 SEP 75   17:00:35   121   |  5  0  |   2633
FDASCC          ELT  SYMB   26 SEP 75   17:01:29   122   |  5  0  |   2634
INFORSC         ELT  SYMB   26 SEP 75   17:01:43   123   |  5  0  |   2635
PREPROC         ELT  SYMB   26 SEP 75   17:01:56   124   |  5  0  |   2636
SDFIC           ELT  SYMB   26 SEP 75   17:02:02   125   |  5  0  |   2637
SDFOC           ELT  SYMB   26 SEP 75   17:02:07   126   |  5  0  |   2638
PAGCOMC         ELT  SYMB   26 SEP 75   17:02:49   127   |  5  0  |   2639
PAGEC           ELT  SYMB   26 SEP 75   17:03:08   128   |  5  0  |   2640
PATCHC          ELT  SYMB   26 SEP 75   17:03:53   129   |  5  0  |   2641
DUMPC           ELT  SYMB   26 SEP 75   17:05:12   130   |  5  0  |   2642
PRT10C          ELT  SYMB   26 SEP 75   17:05:37   131   |  5  0  |   2643
PRT20C          ELT  SYMB   26 SEP 75   17:05:52   132   |  5  0  |   2644
PRT30C          ELT  SYMB   26 SEP 75   17:06:18   133   |  5  0  |   2645
CALLPAC         ELT  SYMB   26 SEP 75   17:07:21   134   |  5  0  |   2646
SVI2C           ELT  SYMB   26 SEP 75   17:07:49   135   |  5  0  |   2647
CVDIVC          ELT  SYMB   26 SEP 75   17:08:20   136   |  5  0  |   2648
BINFOC          ELT  SYMB   26 SEP 75   17:08:28   137   |  5  0  |   2649
STATC           ELT  SYMB   26 SEP 75   17:08:48   138   |  5  0  |   2650
USERC           ELT  SYMB   26 SEP 75   17:09:19   139   |  5  0  |   2651
AEDITSC         ELT  SYMB   26 SEP 75   17:09:27   140   |  5  0  |   2652
RRDTC           ELT  SYMB   26 SEP 75   17:09:27   141   |  5  0  |   2653
SAVC            ELT  SYMB   26 SEP 75   17:09:39   142   |  5  0  |   2654
SDTC            ELT  SYMB   26 SEP 75   17:09:52   143   |  5  0  |   2655
SVCONVC         ELT  SYMB   26 SEP 75   17:13:24   144   |  5  0  |   2656
SV01C           ELT  SYMB   26 SEP 75   17:13:48   145   |  5  0  |   2657
SV02C           ELT  SYMB   26 SEP 75   17:14:15   146   |  5  0  |   2658
SV03C           ELT  SYMB   26 SEP 75   17:14:39   147   |  5  0  |   2659
SV04C           ELT  SYMB   26 SEP 75   17:15:00   148   |  5  0  |   2660
SV06C           ELT  SYMB   26 SEP 75   17:15:35   149   |  5  0  |   2661
SV07C           ELT  SYMB   26 SEP 75   17:15:5[illegible]   150   |  5  0  |   2662
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SV08C                ELT SYMB   26 SEP 75   17:16:13   151    1   5   0   1     2663
SV09C                ELT SYMB   26 SEP 75   17:16:14   152    1   5   0   1     2664
SV10C                ELT SYMB   26 SEP 75   17:16:32   153    1   5   0   1     2665
SV13C                ELT SYMB   26 SEP 75   17:17:05   154    1   5   0   1     2666
SV14C                ELT SYMB   26 SEP 75   17:17:26   155        5   0   1     2667
SV17C                ELT SYMB   26 SEP 75   17:17:45   156    1   5   0   1     2668
SV19C                ELT SYMB   26 SEP 75   17:17:57   157    1   5   0   1     2669
SV20C                ELT SYMB   26 SEP 75   17:18:24   158    1   5   0   1     2670
SV21C                ELT SYMB   26 SEP 75   17:18:43   159    1   5   0   1     2671
SV25C                ELT SYMB   26 SEP 75   17:19:05   160    1   5   0   1     2672
SV26C                ELT SYMB   26 SEP 75   17:19:23   161    1   5   0   1     2673
SV99C                ELT SYMB   26 SEP 75   17:19:42   162    1   5   0   1     2674
DMRMAPC              ELT SYMB   26 SEP 75   17:52:28   163    1   5   0   1     2675
APRCC                ELT SYMB   26 SEP 75   17:52:42   164    3   5   0   1     2676
TH03C                ELT SYMB   26 SEP 75   17:52:56   165    6   5   0   1     2679
DH04C                ELT SYMB   26 SEP 75   17:53:01   166    4   5   0   1     2685
DH10C                ELT SYMB   26 SEP 75   17:53:04   167   94   5   0   1     2689
DH13C                ELT SYMB   26 SEP 75   17:53:08   168    3   5   0   1     2703
100[illegible]       ELT SYMB   26 SEP 75   17:53:15   169    1   5   0   1     2786
GS11C                ELT SYMB   26 SEP 75   17:53:22   170    1   5   0   1     2787
UPDATEC              ELT SYMB   26 SEP 75   17:53:56   171    1   5   0   1     2788
USERSGS     BASE     ELT SYMB   30 SEP 75   06:46:41   172   14   5   0   1     2789
AMAIC                ELT SYMB   30 SEP 75   12:48:58   173   17   5   0   1     2808
DC11C                ELT SYMB   01 OCT 75   16:25:27   174    1   5   0   1     2825
DH29C                ELT SYMB   01 OCT 75   16:25:32   175    2   5   0   1     2826
QUIRECC              ELT SYMB   02 OCT 75   19:12:10   176    1   5   1   2     2828
UTMAPSEGRC           ELT SYMB   07 OCT 75   09:48:24   177    1   5   0   1     2829
CLOSEC               ELT SYMB   07 OCT 75   09:49:08   178    2   5   0   1     2830
UTILITYC             ELT SYMB   07 OCT 75   09:49:10   179    8   5   0   1     2832
INITC                ELT SYMB   07 OCT 75   09:49:10   180    1   5   0   1     2840
SV11C                ELT SYMB   07 OCT 75   09:49:12   181   12   5   0   1     2841
FOMLPPARAMS          ELT SYMB   07 OCT 75   09:54:16   182    4   5   0   1     2853
UTMAPSTC             ELT SYMB   10 OCT 75   16:21:30   183   10   5   0   1     2857
UTMAPMTC             ELT SYMB   10 OCT 75   16:21:31   184   11   5   0   1     2867
UTMAPSEGAC           ELT SYMB   10 OCT 75   16:21:32   185   10   5   0   1     2878
TH17C                ELT SYMB   10 OCT 75   16:21:45   186    5   5   0   1     2888
DH09C                ELT SYMB   10 OCT 75   16:21:45   187    2   5   0   1     2893
DH28C                ELT SYMB   10 OCT 75   16:21:50   188    3   5   0   1     2895
SIRASMC              ELT SYMB   10 OCT 75   16:22:50   189    5   5   0   1     2898
SIRTABC              ELT SYMB   10 OCT 75   16:22:49   190   63   5   0   1     2903
USERSGSC             ELT SYMB   18 OCT 75   09:23:17   191    4   5   0   1     2966
DC05C                ELT SYMB   24 OCT 75   16:05:14   192    3   5   0   1     2970
GS03C                ELT SYMB   24 OCT 75   16:05:19   193    3   5   0   1     2973
ADCMC                ELT SYMB   05 NOV 75   16:57:10   194    2   5   0   1     2976
ARELC                ELT SYMB   05 NOV 75   16:57:12   195    2   5   0   1     2978
SORTBUFC             ELT SYMB   05 NOV 75   16:57:12   196    2   5   0   1     2980
DC030SC              ELT SYMB   05 NOV 75   16:57:16   197    6   5   0   1     2982
QLINITC              ELT SYMB   05 NOV 75   16:57:43   198    3   5   0   1     2988
TIPCOPYC             ELT SYMB   05 NOV 75   16:57:44   199    8   5   0   1     2991
CALCVERC             ELT SYMB   05 NOV 75   16:57:43   200    1   5   0   1     2999
PAGEXPC              ELT SYMB   05 NOV 75   16:57:43   201    2   5   0   1     3002
DTBSDMP2C            ELT SYMB   06 NOV 75   16:42:40   202    2   5   0   1     3004
MERGETCF             ELT SYMB   07 NOV 75   01:19:48   203    2   5   0   1     3006
CUMTCFSKEL           ELT SYMB   11 NOV 75   20:42:30   204    4   5   0   1     3008
TH04C                ELT SYMB   12 NOV 75   16:21:26   205    2   5   0   1     3017
CA01C                ELT SYMB   12 NOV 75   16:21:25   206    3   5   0   1     3019
GS12C                ELT SYMB   19 NOV 75   22:01:40   207    2   5   0   1     3022
P SSEGC              ELT SYMB   19 NOV 75   22:01:52   208    1   5   0   1     3024
SCAC                 ELT SYMB   09 DEC 75   17:07:31   209    2   5   0   1     3025
DC02C                ELT SYMB   09 DEC 75   17:07:39   210    7   5   0   1     3027
TH02C                ELT SYMB   09 DEC 75   17:07:40   211   13   5   0   1     3034
TH05C                ELT SYMB   09 DEC 75   17:07:40   212    3   5   0   1     3047
TH06C                ELT SYMB   09 DEC 75   17:07:42   213   80   5   0   1     3050
DYNDUMPC             ELT SYMB   09 DEC 75   17:08:17   214    4   5   0   1     3130
USERFSGS             ELT SYMB   09 DEC 75   17:37:03   215    1   5   0   1     3134
PARAMSFSSP           ELT SYMB   09 DEC 75   17:37:04   216   11   5   0   1     3135
SSI-ERRPROC          [illegible]
SSOREC               ELT SYMB   09 DEC 75   17:37:08   218    3   5   0   1     3147
SUBSCHEMADCL         ELT SYMB   09 DEC 75   17:37:12   219    7   5   0   1     3150
GENERALIZED          ELT SYMB   09 DEC 75   17:37:13   220    2   5   0   1     3157
STHRSEZREC           ELT SYMB   09 DEC 75   17:37:16   221    2   5   0   1     3159
STHACQINT            [illegible]
COMFSSP              ELT SYMB   09 DEC 75   17:37:21   223   10   5   0   1     3165
COMFDHLP             ELT SYMB   09 DEC 75   17:37:22   224   10   5   0   1     3175
SGSC                 ELT SYMB   18 DEC 75   17:00:58   225   15   5   0   1     3185
DH26C                ELT SYMB   18 DEC 75   17:01:08   226    2   5   0   1     3200
SGS                  [illegible]
MERGESKEL            ELT SYMB   13 JAN 76   17:10:34   228    5   5   0   1     3476
IV08C                ELT SYMB   13 JAN 76   17:11:01   229    3   5   0   1     3481
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DH40C        ELT SYMB   13 JAN 76   17:11:03   230    10   5   0   |      3484
SGLOADC      ELT SYMB   13 JAN 76   17:11:20   231     2   5   0   |      3494
LOADSGC      ELT SYMB   13 JAN 76   17:11:28   232    38   5   0   |      3496
[illegible]  ELT SYMB   [illegible] [illegible] 233    6   5   0   |      3534
ANLIC        ELT SYMB   04 FEB 76   01:39:27   234     2   5   0   |      3540
L$INKRC      ELT SYMB   04 FEB 76   01:39:41   235    14   5   0   |      3542
STMACOST     ELT SYMB   05 FEB 76   17:39:57   236     4   5   0   |      3556
STMACODEF    ELT SYMB   05 FEB 76   17:41:08   237     2   5   0   |      3560
ALEXXC       ELT SYMB   05 FEB 76   17:41:12   238     2   5   0   |      3562
DH19C        ELT SYMB   20 FEB 76   17:34:46   239     7   5   0   |      3564
DH23C        ELT SYMB   20 FEB 76   17:34:58   240     3   5   0   |      3566
DGEC         ELT SYMB   20 FEB 76   17:35:00   241     5   5   0   |      3569
DH08C        ELT SYMB   05 MAR 76   16:31:44   242     2   5   0   |      3574
DMRACTC      ELT SYMB   05 MAR 76   16:31:57   243     5   5   0   |      3576
CHECKPOINTC  ELT SYMB   05 MAR 76   16:32:21   244     3   5   0   |      3581
DMRREPMAPC   ELT SYMB   05 MAR 76   16:32:22   245     5   5   0   |      3584
DH24C        ELT SYMB   19 MAR 76   17:32:00   246     2   5   0   |      3589
DH38C        ELT SYMB   19 MAR 76   17:32:13   247     3   5   0   |      3591
GS01C        ELT SYMB   19 MAR 76   17:32:14   248     2   5   0   |      3594
ASCAC        ELT SYMB   19 MAR 76   17:32:17   249     2   5   0   |      3596
TC01C        ELT SYMB   09 APR 76   16:17:08   250     9   5   0   |      3598
TH14C        ELT SYMB   09 APR 76   16:17:14   251     7   5   0   |      3607
DH11C        ELT SYMB   09 APR 76   16:17:18   252    14   5   0   |      3614
DH17C        ELT SYMB   09 APR 76   16:17:20   253     1   5   0   |      3620
DH27C        ELT SYMB   09 APR 76   16:17:22   254    58   5   0   |      3639
DH42C        ELT SYMB   09 APR 76   16:17:24   255     5   5   0   |      3697
GS13C        ELT SYMB   09 APR 76   16:17:26   256     6   5   0   |      3702
DTBSDMPIC    ELT SYMB   09 APR 76   16:17:32   257    32   5   0   |      3708
SKEL         ELT SYMB   09 APR 76   16:18:10   258    24   5   0   |      3740
SKELC        ELT SYMB   03 MAY 76   22:58:35   259   372   5   0   |      3764
INIC         ELT SYMB   03 MAY 76   22:58:47   260    21   5   0   |      4136
FIXC         ELT SYMB   03 MAY 76   22:58:51   261    38   5   0   |      4157
LOGC         ELT SYMB   03 MAY 76   22:58:52   262     1   5   0   |      4195
IO02C        ELT SYMB   03 MAY 76   22:58:53   263     5   5   0   |      4196
DMRCLRC      ELT SYMB   03 MAY 76   22:59:18   264    38   5   0   |      4201
DDLSC        ELT SYMB   03 MAY 76   22:59:38   265     3   5   0   |      4239
MAIC         ELT SYMB   20 MAY 76   10:02:51   266    13   5   0   |      4242
APDMC        ELT SYMB   20 MAY 76   10:02:54   267    57   5   0   |      4255
GS02C        ELT SYMB   20 MAY 76   10:04:19   268    11   5   0   |      4312
TIMERC       ELT SYMB   20 MAY 76   10:17:57   269    22   5   0   |      4323
DH25C        ELT SYMB   20 MAY 76   10:18:59   270    11   5   0   |      4345
TABC         ELT SYMB   27 MAY 76   08:42:32   271    10   5   0   |      4356
D$WC         ELT SYMB   19 JUN 76   21:24:26   272    28   5   0   |      4366
TC17C        ELT SYMB   19 JUN 76   21:24:27   273    11   5   0   |      4394
DC0303C      ELT SYMB   19 JUN 76   21:24:36   274     2   5   0   |      4405
DH30C        ELT SYMB   19 JUN 76   21:24:36   275    11   5   0   |      4407
DH37C        ELT SYMB   19 JUN 76   21:24:39   276    15   5   0   |      4418
DH43C        ELT SYMB   19 JUN 76   21:24:40   277     4   5   0   |      4433
DH45C        ELT SYMB   19 JUN 76   21:24:40   278    28   5   0   |      4437
DH52C        ELT SYMB   19 JUN 76   21:24:42   279    24   5   0   |      4465
SFINITC      ELT SYMB   19 JUN 76   21:24:42   280     8   5   0   |      4489
DOWNC        ELT SYMB   19 JUN 76   21:25:28   281    20   5   0   |      4497
UPC          ELT SYMB   19 JUN 76   21:25:34   282     2   5   0   |      4517
FSSP         ELT SYMB   19 JUN 76   21:25:34   283     5   5   0   |      4519
DMCATABS     ELT SYMB   19 JUN 76   21:44:30   284     1   5   0   |      4524
OCTAL        ELT SYMB   19 JUN 76   21:44:31   285    14   5   0   |      4525
SSODATA      ELT SYMB   19 JUN 76   21:44:32   286     1   5   0   |      4539
SSOFTN       ELT SYMB   19 JUN 76   21:44:34   287    23   5   0   |      4540
FDMLP        ELT SYMB   19 JUN 76   21:44:36   288    28   5   0   |      4563
FDMLPDICT    ELT SYMB   19 JUN 76   21:44:38   289    41   5   0   |      4591
FDMLPERRP    ELT SYMB   19 JUN 76   21:44:39   290     4   5   0   |      4632
STMPROC2     ELT SYMB   19 JUN 76   21:44:39   291     1   5   0   |      4636
FDIINCLUDE   ELT SYMB   19 JUN 76   21:44:41   292     8   5   0   |      4637
TH04C        ELT SYMB   19 JUN 76   21:44:47   293    10   5   0   |      4645
CA02C        ELT SYMB   21 JUN 76   21:51:52   294    56   5   0   |      4655
RR01C        ELT SYMB   21 JUN 76   21:51:53   295    33   5   0   |      4711
UT01C        ELT SYMB   21 JUN 76   21:51:54   296     1   5   0   |      4744
SGPC         ELT SYMB   21 JUN 76   21:51:54   297     1   5   0   |      4745
DMUPC        ELT SYMB   20 JUL 76   19:00:12   298     8   5   0   |      4746
SCHC         ELT SYMB   20 JUL 76   19:00:14   299     2   5   0   |      4754
INVC         ELT SYMB   20 JUL 76   19:00:15   300     2   5   0   |      4756
LEVC         ELT SYMB   20 JUL 76   19:00:18   301     1   5   0   |      4758
SMMC         ELT SYMB   20 JUL 76   19:00:18   302     2   5   0   |      4759
IV03C        ELT SYMB   20 JUL 76   19:00:20   303     1   5   0   |      4761
DC0307C      ELT SYMB   20 JUL 76   19:00:39   304    54   5   0   |      4762
DC12C        ELT SYMB   20 JUL 76   19:00:47   305    16   5   0   |      4816
DH01C        ELT SYMB   20 JUL 76   19:00:48   306     4   5   0   |      4832
DH18C        ELT SYMB   20 JUL 76   19:00:50   307    62   5   0   |      4836
             ELT SYMB   20 JUL 76   19:00:53   308    12   5   0   |      4898
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   CADSC                         ELT SYMB     20 JUL 76    19:00:57    309           2     5   0   1        4910
   UTO3C                         ELT SYMB     20 JUL 76    19:01:01    310          18     5   0   1        4912
   GS07C                         ELT SYMB     20 JUL 76    19:01:03    311          42     6   0   1        4930
   SELRECC                       ELT SYMB     20 JUL 76    19:01:29    312          41     5   0   1        4972
   IV00C                         ELT SYMB     09 AUG 76    08:36:07    313          58     5   0   1        5013
   IV01C                         ELT SYMB     09 AUG 76    08:36:09    314          74     5   0   1        5071
   IV05C                         ELT SYMB     09 AUG 76    08:36:12    315          10     5   0   1        5145
   IV06C                         ELT SYMB     09 AUG 76    08:36:17    316          29     5   0   1        5155
   IV07C                         ELT SYMB     09 AUG 76    08:36:18    317           5     5   0   1        5184
   IV09C                         ELT SYMB     09 AUG 76    08:36:18    318          28     5   0   1        5189
   DH16C                         ELT SYMB     09 AUG 76    08:36:19    319          30     5   0   1        5217
   GS09C                         ELT SYMB     09 AUG 76    08:36:27    320          18     5   0   1        5247
   LONGRECOVERY                  ELT SYMB     09 AUG 76    08:38:38    321          89     5   0   1        5265
   DMUSCANC                      ELT SYMB     09 AUG 76    08:38:49    322          21     5   0   1        5349
   PRINTC                        ELT SYMB     09 AUG 76    08:38:49    323           2     5   0   1        5370
   STUFFC                        ELT SYMB     09 AUG 76    08:38:49    324           2     5   0   1        5372
   SVOSC                         ELT SYMB     09 AUG 76    08:38:50    325           4     5   0   1        5374
   FSSPEQUFS                     ELT SYMB     11 AUG 76    07:57:05    326           2     5   0   1        5378
   DICTFSSP                      ELT SYMB     11 AUG 76    07:57:07    327           5     5   0   1        5380
   ASI                           ELT SYMB     11 AUG 76    07:57:08    328           2     5   0   1        5385
   SSODSW                        ELT SYMB     11 AUG 76    07:57:11    329           8     5   0   1        5387
   LNK                           ELT SYMB     11 AUG 76    07:57:19    330           6     5   0   1        5395
   APICC                         ELT SYMB     26 AUG 76    22:21:29    331          12     5   0   1        5401
   LINKERC                       ELT SYMB     26 AUG 76    22:21:30    332          20     5   0   1        5413
   TC09C                         ELT SYMB     26 AUG 76    22:21:33    333          20     5   0   1        5433
   TC13C                         ELT SYMB     26 AUG 76    22:21:35    334          90     5   0   1        5453
   TC15C                         ELT SYMB     26 AUG 76    22:21:35    335          45     5   0   1        5543
   DC07C                         ELT SYMB     26 AUG 76    22:21:36    336           3     5   0   1        5588
   DC08C                         ELT SYMB     26 AUG 76    22:21:37    337          36     5   0   1        5591
   DH20C                         ELT SYMB     26 AUG 76    22:21:37    338          13     5   0   1        5627
   DH36C                         ELT SYMB     26 AUG 76    22:21:38    339          40     5   0   1        5640
   DH39C                         ELT SYMB     26 AUG 76    22:21:38    340          20     5   0   1        5680
   DH44C                         ELT SYMB     26 AUG 76    22:21:39    341          43     5   0   1        5700
   DH46C                         ELT SYMB     26 AUG 76    22:21:40    342          10     5   0   1        5743
   RADSC                         ELT SYMB     26 AUG 76    22:21:41    343          88     5   0   1        5753
   DBKPRTC                       ELT SYMB     26 AUG 76    22:22:04    344           2     5   0   1        5841
   FSKEL                         ELT SYMB     26 AUG 76    22:33:57    345          22     5   0   1        5843
   INVOKE                        ELT SYMB     26 AUG 76    22:34:18    346           3     5   0   1        5865
   MAPFSSP                       ELT SYMB     26 AUG 76    22:34:20    347           9     5   0   1        5868
   MAPFDMLP                      ELT SYMB     26 AUG 76    22:34:21    348           9     5   0   1        5877
   MGSGS                         ELT SYMB     26 AUG 76    22:44:06    349          19     5   0   1        5886
   MERGESGS                      ELT SYMB     26 AUG 76    22:50:44    350           1     5   0   1        5900
   IVO2C                         ELT SYMB     27 AUG 76    10:52:03    351         206     5   1   2        5901
   USERSGS                       ELT SYMB     28 SEP 76    04:23:00    352          20     5   2   5        6107
   ALEVC                         ELT SYMB     28 SEP 76    04:23:50    353           2     5   0   1        6127
   ENVELOPE                      ELT SYMB     28 SEP 76    04:25:20    354           6     5   0   1        6129
   TCF                           ELT SYMB     01 OCT 76    10:51:09    355          28     5   0   1        6135
NEXT AVAILABLE LOCATION=                                                                                    6163

ASSEMBLER PROCEDURE TABLE EMPTY

COBOL PROCEDURE TABLE EMPTY

FORTRAN PROCEDURE TABLE EMPTY

ENTRY POINT TABLE EMPTY

@PRT,IL F9.

LEE*F9(1)    ELEMENT TABLE

D  NAME              VERSION          TYPE          DATE         TIME      SEQ #  SIZE-PRE,TEXT  ICYCLE WORD) PSRMODE  LOCATION
   DUMP                            ASM SYMB      28 MAR 73    10:40:01      1            24       5    0    1               1792
   SEGDMRLIST                      ELT SYMB      24 APR 74    02:34:04      2             2       5    0    1               1816
   DMRLIST                         ELT SYMB      25 APR 74    02:34:14      3   [illegible]                  1               [illegible]
   SGDATA                          [illegible]   [illegible]  [illegible]   4            47       5    0    1               1822
   SGLOADMAP                       MAP SYMB      29 APR 74    03:04:29      5            46       5    0    1               1869
   RESELT                          ASM SYMB      29 APR 74    03:05:44      6             1       5    0    1               1915
   RESELT                          RELOCATABLE   29 APR 74    03:05:44      7             0                                 1916
   SDMRMAP                         MAP SYMB      29 APR 74    03:05:45      8            18       5    0    1               1917
   SGLOAD                          ABSOLUTE      29 APR 74    03:07:02      9          1590                                  1935
   SKEL             BASE           ELT SYMB      16 MAY 74    06:58:40     10           296       5    0    1               3526
   DMSUP                           ELT SYMB      15 APR 74    19:59:05     11             5       5    0    1               3821
   DMRMAP           BASE           ELT SYMB      06 SEP 75    08:25:44     12            33       5    0    1               3826
   DMSSGP           BASE           ASM PROC      06 SEP 75    08:26:20     13           173       5    0    1               3859
   [illegible]      BASE           ASM PROC      06 SEP 75    08:2[illegible]  14   [illegible]                            [illegible]
   DMRTAB           BASE           [illegible]   [illegible]  08:27:31     15           392       5    0    1               4542
                                   ASM PROC      06 SEP 75    08:28:50     16          1993       5    0    1               4934
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DSWORK     BASE     ASM PROC    06 SEP 75    08:30:43    17     593    5    0    1     6927
SORTBUF             ASM SYMB    06 SEP 75    08:32:07    18      11    5    0    1     7020
LINKER              ASM SYMB    06 SEP 75    08:32:41    19     479    5    0    1     7031
LSINKR              ASM SYMB    06 SEP 75    08:33:41    20     283    5    0    1     7510
IV00                ASM SYMB    06 SEP 75    08:35:04    21     296    5    0    1     7793
IV01                ASM SYMB    06 SEP 75    08:37:07    22     401    5    0    1     8089
IV02                ASM SYMB    06 SEP 75    08:38:15    23    1557    5    0    1     8490
IV03                ASM SYMB    06 SEP 75    08:39:59    24     529    5    0    1    10047
IV04                ASM SYMB    06 SEP 75    [illegible] [illegible] [illegible] 5    0    1    10576
IV05                ASM SYMB    06 SEP 75    08:41:16    26     203    5    0    1    10655
                        SYMB    06 SEP 75    08:41:44    27      90    5    0    1    10858
IV07                ASM SYMB    06 SEP 75    08:42:10    28      79    5    0    1    10948
IV08                ASM SYMB    06 SEP 75    08:42:35    29      60    5    0    1    11027
IV09                ASM SYMB    06 SEP 75    08:43:00    30     100    5    0    1    11087
TC01                ASM SYMB    06 SEP 75    08:43:37    31     101    5    0    1    11187
TC04                ASM SYMB    06 SEP 75    08:44:14    32      24    5    0    1    11288
TC06                ASM SYMB    06 SEP 75    08:44:40    33      25    5    0    1    11312
TC09                ASM SYMB    06 SEP 75    08:45:17    34     338    5    0    1    11337
TC13                ASM SYMB    06 SEP 75    08:46:10    35     535    5    0    1    11675
TC14                ASM SYMB    06 SEP 75    08:46:51    36      72    5    0    1    12210
TC15                ASM SYMB    06 SEP 75    08:47:32    37     431    5    0    1    12282
TC16                ASM SYMB    06 SEP 75    08:48:08    38     114    5    0    1    12713
TC17                ASM SYMB    06 SEP 75    08:48:36    39      77    5    0    1    12827
DC02                ASM SYMB    06 SEP 75    08:49:22    40     456    5    0    1    12904
DC0301              ASM SYMB    06 SEP 75    08:50:25    41      62    5    0    1    13360
DC0302              ASM SYMB    06 SEP 75    08:50:48    42      28    5    0    1    13422
DC0303              ASM SYMB    06 SEP 75    08:51:24    43     389    5    0    1    13450
DC0305              ASM SYMB    06 SEP 75    08:52:04    44      53    5    0    1    13839
DC0306              ASM SYMB    06 SEP 75    08:52:35    45      68    5    0    1    13892
DC0307              ASM SYMB    06 SEP 75    08:53:06    46     168    5    0    1    13960
DC05                ASM SYMB    06 SEP 75    08:53:39    47      84    5    0    1    14128
DC07                ASM SYMB    06 SEP 75    08:54:37    48     190    5    0    1    14212
DC08                ASM SYMB    06 SEP 75    08:55:20    49     666    5    0    1    14402
DC11                ASM SYMB    06 SEP 75    08:55:58    50     132    5    0    1    15068
DC12                ASM SYMB    06 SEP 75    08:56:40    51     168    5    0    1    15200
DC14                ASM SYMB    06 SEP 75    08:57:14    52     118    5    0    1    15368
DC21                ASM SYMB    06 SEP 75    08:57:58    53     257    5    0    1    15486
TH01                ASM SYMB    06 SEP 75    08:58:21    54      17    5    0    1    15743
TH02                ASM SYMB    06 SEP 75    08:58:46    55     135    5    0    1    15760
TH03                ASM SYMB    06 SEP 75    08:59:16    56     108    5    0    1    15895
TH04                ASM SYMB    06 SEP 75    08:59:47    57     188    5    0    1    16003
TH05                ASM SYMB    06 SEP 75    09:00:18    58      38    5    0    1    16191
TH06                ASM SYMB    06 SEP 75    09:01:12    59     616    5    0    1    16229
TH08                ASM SYMB    06 SEP 75    09:02:31    60      32    5    0    1    16845
TH09                ASM SYMB    06 SEP 75    09:03:04    61     272    5    0    1    16877
TH12                ASM SYMB    06 SEP 75    09:03:41    62      39    5    0    1    17149
TH14                ASM SYMB    06 SEP 75    09:04:03    63      67    5    0    1    17188
TH15                ASM SYMB    06 SEP 75    09:04:29    64      50    5    0    1    17255
TH17                ASM SYMB    06 SEP 75    09:04:53    65      55    5    0    1    17305
TH20                ASM SYMB    06 SEP 75    09:05:18    66      52    5    0    1    17360
DH01                ASM SYMB    06 SEP 75    09:05:57    67     685    5    0    1    17412
DH03                ASM SYMB    06 SEP 75    09:06:40    68      47    5    0    1    18097
DH04                ASM SYMB    06 SEP 75    09:06:56    69      55    5    0    1    18144
DH05                ASM SYMB    06 SEP 75    09:07:27    70     354    5    0    1    18199
DH07                ASM SYMB    06 SEP 75    09:08:00    71      83    5    0    1    18553
DH08                ASM SYMB    06 SEP 75    09:08:33    72     277    5    0    1    18636
DH09                ASM SYMB    06 SEP 75    09:09:18    73     596    5    0    1    18913
DH10                ASM SYMB    06 SEP 75    09:09:56    74     328    5    0    1    19509
DH11                ASM SYMB    06 SEP 75    09:10:29    75     245    5    0    1    19837
DH12                ASM SYMB    06 SEP 75    09:10:59    76      42    5    0    1    20082
DH13                ASM SYMB    06 SEP 75    09:11:12    77     140    5    0    1    20124
DH14                ASM SYMB    06 SEP 75    09:11:56    78      98    5    0    1    20264
DH16                ASM SYMB    06 SEP 75    09:12:32    79     265    5    0    1    20362
DH17                ASM SYMB    06 SEP 75    09:13:16    80     505    5    0    1    20627
DH18                ASM SYMB    06 SEP 75    09:13:51    81     164    5    0    1    21132
DH19                ASM SYMB    06 SEP 75    09:14:30    82     503    5    0    1    21296
DH20                ASM SYMB    06 SEP 75    09:15:09    83     115    5    0    1    21799
DH21                ASM SYMB    06 SEP 75    09:15:30    84      60    5    0    1    21914
DH22                ASM SYMB    06 SEP 75    09:15:54    85      35    5    0    1    21974
DH23                ASM SYMB    06 SEP 75    09:16:21    86     165    5    0    1    22009
DH24                ASM SYMB    06 SEP 75    09:16:43    87      53    5    0    1    22174
DH25                ASM SYMB    06 SEP 75    09:17:11    88      99    5    0    1    22227
DH26                ASM SYMB    06 SEP 75    09:17:37    89      48    5    0    1    22326
DH27                ASM SYMB    06 SEP 75    09:18:14    90     475    5    0    1    22374
DH28                ASM SYMB    06 SEP 75    09:18:58    91     523    5    0    1    22849
DH29                ASM SYMB    06 SEP 75    09:19:46    92     499    5    0    1    23372
DH30                ASM SYMB    06 SEP 75    09:20:24    93     167    5    0    1    23871
DH31                ASM SYMB    06 SEP 75    09:20:55    94     274    5    0    1    24038
DH34                ASM SYMB    06 SEP 75    09:21:24    95     103    5    0    1    24312
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DH35      ASM SYMB      06 SEP 75   09:21:49   96         79   5   0   1      24415
DH36      ASM SYMB      06 SEP 75   09:22:23   97         30   5   0   1      24494
DH37      ASM SYMB      06 SEP 75   09:22:48   98         64   5   0   1      24795
DH38      ASM SYMB      06 SEP 75   09:23:10   99         59   5   0   1      24859
DH39      ASM SYMB      06 SEP 75   09:23:41  100        333   5   0   1      24918
DH40      ASM SYMB      06 SEP 75   09:24:28  101        682   5   0   1      25251
DH42      ASM SYMB      06 SEP 75   09:25:08  102        287   5   0   1      25933
DH43      ASM SYMB      06 SEP 75   09:26:00  103        888   5   0   1      26220
DH44      ASM SYMB      06 SEP 75   09:26:55  104        594   5   0   1      27108
DH45      ASM SYMB      06 SEP 75   09:28:01  105        472   5   0   1      27702
DH46      ASM SYMB      06 SEP 75   09:28:43  106        119   5   0   1      28174
DH47      ASM SYMB      06 SEP 75   09:29:11  107         50   5   0   1      28293
DH50      ASM SYMB      06 SEP 75   09:29:42  108        190   5   0   1      28343
DH51      ASM SYMB      06 SEP 75   09:30:16  109         90   5   0   1      28533
DH52      ASM SYMB      06 SEP 75   09:30:41  110         69   5   0   1      28623
CA01      ASM SYMB      06 SEP 75   09:31:04  111        156   5   0   1      28692
CA02      ASM SYMB      06 SEP 75   09:31:36  112        156   5   0   1      28848
CA03      ASM SYMB      06 SEP 75   09:31:52  113         27   5   0   1      29004
CA04      ASM SYMB      06 SEP 75   09:32:08  114         56   5   0   1      29031
CA05      ASM SYMB      06 SEP 75   09:32:29  115         18   5   0   1      29087
I001      ASM SYMB      06 SEP 75   09:32:45  116         34   5   0   1      29105
I002      ASM SYMB      06 SEP 75   09:33:15  117        292   5   0   1      29139
I005      ASM SYMB      06 SEP 75   09:33:34  118          9   5   0   1      29431
RR01      ASM SYMB      06 SEP 75   09:33:56  119        146   5   0   1      29440
RR05      ASM SYMB      06 SEP 75   09:34:36  120        576   5   0   1      29586
UT01      ASM SYMB      06 SEP 75   09:35:06  121         75   5   0   1      30162
UT02      ASM SYMB      06 SEP 75   09:35:36  122        372   5   0   1      30237
UT03      ASM SYMB      06 SEP 75   09:36:03  123        304   5   0   1      30609
UT04      ASM SYMB      06 SEP 75   09:36:32  124         91   5   0   1      30913
GS01      ASM SYMB      06 SEP 75   09:36:51  125         57   5   0   1      31004
GS02      ASM SYMB      06 SEP 75   09:37:30  126        474   5   0   1      31061
GS03      ASM SYMB      06 SEP 75   09:37:58  127        143   5   0   1      31535
GS04      ASM SYMB      06 SEP 75   09:38:39  128        396   5   0   1      31678
GS07      ASM SYMB      06 SEP 75   09:39:11  129        223   5   0   1      32074
GS09      ASM SYMB      06 SEP 75   09:39:36  130         95   5   0   1      32297
GS10      ASM SYMB      06 SEP 75   09:39:58  131         33   5   0   1      32392
GS11      ASM SYMB      06 SEP 75   09:40:15  132         59   5   0   1      32425
GS12      ASM SYMB      06 SEP 75   09:40:44  133        404   5   0   1      32484
GS13      ASM SYMB      06 SEP 75   09:41:12  134        282   5   0   1      32888
SGLOAD    ASM SYMB      06 SEP 75   09:41:36  135        249   5   0   1      33170
RESSEG    ASM SYMB      06 SEP 75   09:41:54  136          1   5   0   1      33419
DMRMAP    ELT SYMB      26 SEP 75   17:55:38  137         33   5   0   1      33420
TC06      RELOCATABLE   26 SEP 75   18:13:53  138    1     2                  33453
DCD301    RELOCATABLE   26 SEP 75   18:17:23  139    1     5                  33456
TH08      RELOCATABLE   26 SEP 75   18:25:56  140    1     2                  33462
TH12      RELOCATABLE   26 SEP 75   18:26:46  141    1     4                  33465
DH03      RELOCATABLE   26 SEP 75   18:28:59  142    1     4                  33470
DH13      RELOCATABLE   26 SEP 75   18:32:54  143    1    13                  33475
CA03      RELOCATABLE   26 SEP 75   18:49:23  144    1     2                  33489
I005      RELOCATABLE   26 SEP 75   18:50:42  145    1     1                  33492
GS10      RELOCATABLE   26 SEP 75   18:55:05  146    1     4                  33494
SORTBUF   RELOCATABLE   05 NOV 75   17:02:57  147    1     7                  33499
RESSEG    RELOCATABLE   19 NOV 75   22:09:29  148    1     0                  33507
SGS       ELT SYMB      18 DEC 75   17:00:42  149        274   5   0   1      33508
PACKET    ASM PROC      04 FEB 76   01:40:29  150        394   5   0   1      33782
TH14      RELOCATABLE   09 APR 76   16:35:57  151    2     6                  34176
KEL       ELT SYMB      03 MAY 76   22:58:35  152        372   5   0   1      34184
DMRTAB    ASM PROC      14 JUN 76   21:26:44  153       1511   5   0   1      34556
DSWORK    ASM PROC      14 JUN 76   21:27:36  154        598   5   0   1      36067
DMS2      RELOCATABLE   14 JUN 76   21:34:47  155    1     5                  36665
DMSSGP    ASM PROC      20 JUL 76   19:01:58  156        177   5   0   1      36671
SCHEMA    ASM PROC      20 JUL 76   19:02:58  157        510   1   0   1      36848
LSINKR    RELOCATABLE   20 JUL 76   19:22:04  158    3     9                  37358
IV03      RELOCATABLE   20 JUL 76   19:25:57  159    4    37                  37370
IV04      RELOCATABLE   20 JUL 76   19:26:17  160    3     4                  [illegible]
IV08      RELOCATABLE   20 JUL 76   19:27:45  161    1     1                  37418
TC01      RELOCATABLE   20 JUL 76   19:28:33  162    2     9                  37420
TC04      RELOCATABLE   20 JUL 76   19:28:54  163    1     2                  37431
TC14      RELOCATABLE   20 JUL 76   19:30:59  164    1     6                  37434
TC16      RELOCATABLE   20 JUL 76   19:31:58  165    2     9                  37440
TC17      RELOCATABLE   20 JUL 76   19:32:17  166    1     1                  37451
DC02      RELOCATABLE   20 JUL 76   19:33:12  167    3    34                  37453
DC0302    RELOCATABLE   20 JUL 76   19:33:34  168    1     2                  37495
DC0303    RELOCATABLE   20 JUL 76   19:34:28  169    4    35                  37498
DC0305    RELOCATABLE   20 JUL 76   19:34:56  170    2     6                  37537
DC0306    RELOCATABLE   20 JUL 76   19:35:26  171    2     6                  37546
DC0307    RELOCATABLE   20 JUL 76   19:36:[illegible]  172    [illegible]     [illegible]                  [illegible]
DC05      RELOCATABLE   20 JUL 76   19:37:48  173    2     7                  37668
DC11      RELOCATABLE   20 JUL 76   19:43:08  174    2    11                  37677
```

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DC12              RELOCATABLE  20 JUL 76   19:44:56   175    2   16            37590
DC14              RELOCATABLE  20 JUL 76   19:46:25   176    1   10            37608
DC21              RELOCATABLE  20 JUL 76   19:49:29   177    2   18            [illegible]
TH01              RELOCATABLE  20 JUL 76   19:50:37   178    [illegible]       37639
TH02              RELOCATABLE  20 JUL 76   19:52:40   179    2   10            37641
TH03              RELOCATABLE  20 JUL 76   19:54:40   180    2    8            37653
TH04              RELOCATABLE  20 JUL 76   19:56:51   181    3   19            37663
TH05              RELOCATABLE  20 JUL 76   19:58:43   182    2    1            [illegible]
TH06              RELOCATABLE  20 JUL 76   [illegible] 183   [illegible]       37685
TH09              RELOCATABLE  20 JUL 76   20:04:50   184    2   24            37744
[illegible]       RELOCATABLE  20 JUL 76   20:06:18   185    1    3            37770
TH17              RELOCATABLE  20 JUL 76   20:07:57   186    1    4            37774
TH20              RELOCATABLE  20 JUL 76   20:09:07   187    1    4            37779
DH01              RELOCATABLE  20 JUL 76   20:11:09   188    3   46            37784
DH04              RELOCATABLE  20 JUL 76   20:11:46   189    1    3            37833
DH05              RELOCATABLE  20 JUL 76   20:13:15   190    2   28            37837
DH07              RELOCATABLE  20 JUL 76   20:15:02   191    1    7            37867
DH08              RELOCATABLE  20 JUL 76   20:17:09   192    2   26            37875
DH09              RELOCATABLE  20 JUL 76   20:19:35   193    2   49            37903
DH10              RELOCATABLE  20 JUL 76   20:21:20   194    2   18            37954
DH11              RELOCATABLE  20 JUL 76   20:23:12   195    2   17            37974
DH12              RELOCATABLE  20 JUL 76   20:25:00   196    1    6            37993
DH14              RELOCATABLE  20 JUL 76   20:26:33   197    1    8            38000
DH17              RELOCATABLE  20 JUL 76   20:31:29   198    2   40            38009
DH18              RELOCATABLE  20 JUL 76   20:33:12   199    2   14            38054
DH19              RELOCATABLE  20 JUL 76   20:35:13   200    3   43            38070
DH21              RELOCATABLE  20 JUL 76   20:36:24   201    1    5            38116
DH22              RELOCATABLE  20 JUL 76   20:36:48   202    1    2            38122
DH23              RELOCATABLE  20 JUL 76   20:37:12   203    2   13            38125
DH24              RELOCATABLE  20 JUL 76   20:37:31   204    1    3            38140
DH25              RELOCATABLE  20 JUL 76   20:38:10   205    1    4            38144
DH26              RELOCATABLE  20 JUL 76   20:38:39   206    2    4            38149
DH27              RELOCATABLE  20 JUL 76   20:39:06   207    3   31            38155
DH28              RELOCATABLE  20 JUL 76   20:39:46   208    3   38            38189
DH29              RELOCATABLE  20 JUL 76   20:40:27   209    3   39            38230
DH30              RELOCATABLE  20 JUL 76   20:40:56   210    2   14            38267
DH31              RELOCATABLE  20 JUL 76   20:41:25   211    2   27            38283
DH34              RELOCATABLE  20 JUL 76   20:41:50   212    1    8            38312
DH35              RELOCATABLE  20 JUL 76   20:42:15   213    1    6            38321
DH37              RELOCATABLE  20 JUL 76   20:43:37   214    1    7            38328
DH38              RELOCATABLE  20 JUL 76   20:43:59   215    2    4            38336
DH40              RELOCATABLE  20 JUL 76   20:45:20   216    2   57            38342
DH42              RELOCATABLE  20 JUL 76   20:45:53   217    2   20            38401
DH43              RELOCATABLE  20 JUL 76   20:46:52   218    3   68            38423
DH45              RELOCATABLE  20 JUL 76   20:48:39   219    2   38            38444
DH47              RELOCATABLE  20 JUL 76   20:49:44   220    1    3            38534
DH50              RELOCATABLE  20 JUL 76   20:50:33   221    2   19            38538
DH51              RELOCATABLE  20 JUL 76   20:50:59   222    2    8            38559
CA01              RELOCATABLE  20 JUL 76   20:51:16   223    2   13            38569
CA02              RELOCATABLE  20 JUL 76   20:51:38   224    2   14            38584
CA04              RELOCATABLE  20 JUL 76   20:51:53   225    1    4            38600
CA05              RELOCATABLE  20 JUL 76   20:52:07   226    1    2            38605
IO01              RELOCATABLE  20 JUL 76   20:52:27   227    1    2            38608
IO02              RELOCATABLE  20 JUL 76   20:52:52   228    2   11            38611
RR01              RELOCATABLE  20 JUL 76   20:53:12   229    1    1            38624
UT01              RELOCATABLE  20 JUL 76   20:54:19   230    3    3            38626
UT02              RELOCATABLE  20 JUL 76   20:54:44   231    1    1            38632
UT03              RELOCATABLE  20 JUL 76   20:55:11   232    1    1            38634
UT04              RELOCATABLE  20 JUL 76   20:55:43   233    1    1            38636
GS01              RELOCATABLE  20 JUL 76   20:56:03   234    1    5            38638
GS02              RELOCATABLE  20 JUL 76   20:56:44   235    2   39            38644
GS03              RELOCATABLE  20 JUL 76   20:57:04   236    1   11            38680
GS07              RELOCATABLE  20 JUL 76   20:57:56   237    4   19            38692
GS09              RELOCATABLE  20 JUL 76   20:58:15   238    2    4            38715
GS11              RELOCATABLE  20 JUL 76   20:58:29   239    1    5            38721
GS12              RELOCATABLE  20 JUL 76   20:58:56   240    1    1            38727
GS13              RELOCATABLE  20 JUL 76   20:59:35   241    1   21            38729
SGLOAD            RELOCATABLE  20 JUL 76   20:59:55   242    1    1            38751
IV00              RELOCATABLE  09 AUG 76   08:46:10   243   13  514            38753
IV01              RELOCATABLE  09 AUG 76   08:46:58   244    3   18            39280
IV05              RELOCATABLE  09 AUG 76   08:51:03   245    3   19            39301
IV06              RELOCATABLE  09 AUG 76   08:51:30   246    1    1            39318
IV07              RELOCATABLE  09 AUG 76   08:52:07   247    1    1            39320
IV09              RELOCATABLE  09 AUG 76   08:52:36   248    1    1            39322
DH16              RELOCATABLE  09 AUG 76   08:54:22   249    2   21            39324
GS04              RELOCATABLE  09 AUG 76   08:56:20   250    3   26            39347
LINKER            RELOCATABLE  26 AUG 76   22:23:11   251    4   25            [illegible]376
TC09              RELOCATABLE  26 AUG 76   22:24:17   252    2   22            [illegible]405
TC13              RELOCATABLE  26 AUG 76   22:24:48   253    [illegible]
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    TC15                            RELOCATABLE  26 AUG 76   22:25:16      254      3      28                          39471
    DC07                            RELOCATABLE  26 AUG 76   22:25:38      255      2      17                          39502
    DC08                            RELOCATABLE  26 AUG 76   22:26:18      256      3      53                          39521
    DH20                            RELOCATABLE  26 AUG 76   22:26:34      257      2      10                          39577
    DH36                            RELOCATABLE  26 AUG 76   22:27:01      258      3      24                          39589
    DH39                            RELOCATABLE  26 AUG 76   22:27:31      259      2      27                          39616
    DH44                            RELOCATABLE  26 AUG 76   22:28:08      260      2      47                          39645
    DH46                            RELOCATABLE  26 AUG 76   22:28:29      261      2      10                          39694
    RR05                            RELOCATABLE  26 AUG 76   22:28:55      262      4      26                          39706
    IV02                            RELOCATABLE  27 AUG 76   11:19:22      263      1       1                          39736
    DMR                             RELOCATABLE  27 AUG 76   11:19:31      264      3    2076                          39738
NEXT AVAILABLE LOCATION=                                                                                                  41817

                         ASSEMBLER PROCEDURE TABLE

D NAME             LOCATION       LINK    D NAME              LOCATION       LINK    D NAME              LOCATION       LINK
  ATWENT            1008777       153     * ATWENT              178862        16       BACKO              1007768       153
* BACKO              177853        16       BACK1              1007768       153     * BACK1               177853        16
  CALL              1006593       153     * CALL                176678        16       CCT                1025796       154
* CCT                195716        17     * CHB                 176573        16       CHB                1006488       153
* CHG                176573        16       CHG                1006488       153       CL$1               1025843       154
* CL$1               195763        17       C$TSQ              1008537       153     * C$TSQ               178622        16
* DMRTAB             138158        16       DMRTAB              967574       153       DMR$SNAP           1009289       153
* DMR$SNAP           179374        16       DMSSGP             1026794       156     * DMSSGP              108058        13
  D$WORK            1009437       154     * D$WORK              180017        17       ERROR              1025678       154
* ERROR              195598        17     * EXITAO              178273        16       EXITAO             1008188       153
* EXITA1             178318        16       EXITA1             1008233       153       EXITO              1008008       153
* EXITO              178093        16       EXIT1              1008053       153     * EXIT1               178138        16
  FERR              1025678       154     * FERR                195598        17       INCR               1025722       154
* INCR               195642        17     * INDHIO              179012        16       INDHIO             1008927       153
* JCALL              177508        16       JCALL              1007423       153       JE                 1025466       154
* JE                 195386        17       JEP                1025466       154     * JEP                 195386        17
  JEZ               1025593       154     * JEZ                 195513        17     * JG                  195386        17
  JG                1025466       154       JLE                1025466       154     * JLE                 195386        17
* JNE                195386        17       JNE                1025466       154     * JNEZ                195513        17
  JNEZ              1025593       154       JNV                1025593       154     * JNV                 195513        17
* JNW                195386        17       JNW                1025466       154       JOP                1025466       154
* JOP                195386        17     * JPV                 195513        17       JPV                1025593       154
  JW                1025466       154     * JW                  195386        17     * LBJ                 179314        16
  LBJ               1009229       153     * NORBK               177853        16       NORBK              1007768       153
  NOTDMR            1026794       156     * NOTDMR              108058        13       OP$1               1025843       154
  OP$1               195763        17       PACKET              945902       150     * PACKET              127182        15
  PARRAY            1025934       154     * PARRAY              195854        17     * RCTGEN              179869        16
  RCTGEN            1009784       153       RD$1               1025843       154     * RD$1                195763        17
  RESTOR            1008143       153     * RESTOR              178228        16     * RF$FCT              195148        17
  RF$FCT            1025228       154     * RF$POOL             195323        17       RF$POOL            1025403       154
  RSTORA             178408        16       RSTORA             1008323       153     * RUQENT              178697        16
  RUQENT            1008612       153     * SAVEA               178363        16       SAVEA              1008278       153
* SAVEXA             178183        16       SAVEXA             1008098       153       SCHEMA             1031750       157
* SCHEMA             112902        14     * SET                 195684        17       SET                1025764       154
* SINCLR             178577        16       SINCLR             1008492       153       SINEXT             1008432       153
* SINEXT             178517        16     * T$CELL              178453        16       T$CELL             1008368       153
* WR$1               195763        17       WR$1               1026843       154

COBOL PROCEDURE TABLE EMPTY

FORTRAN PROCEDURE TABLE EMPTY

ENTRY POINT TABLE EMPTY

@PRT,TL FS.

LEE*FS(1)   ELEMENT TABLE

D  NAME          VERSION        TYPE          DATE        TIME      SEQ #  SIZE-PRE,TEXT [illegible]
   CLSEGS                       ELT SYMB     07 MAR 72   16:40:16      1                 1    5   0   1             1792
   CLSEGS                       RELOCATABLE  09 MAR 72   16:40:17      2       1         0                          1793
   XDRUMS                       ELT SYMB     19 APR 72   19:26:30      3                47    5   0   1             1794
   CHGUNITS                     ELT SYMB     11 JAN 73   20:51:57      4                 1    5   0   1             1841
   TIMLT                        ELT SYMB     01 APR 73   12:37:41      5                 1    5   1   [illegible]   [illegible]
   DMRMAP                       [illegible]  [illegible] [illegible]   6                 5    5   0   1             1843
   DMRCLEAR                     ELT SYMB     15 APR 74   19:58:56      7                 1    5   0   1             1848
   REP1LIST                     ELT SYMB     25 APR 74   02:39:36      8                 4    5   1   2             1849
   SGLOADMAP                    MAP SYMB     29 APR 74   03:06:05      9                21    5   0   1             1853
   RESELT                       ASM SYMB     29 APR 74   03:07:26     10                 1    5   0   1             1874
   RESELT                       RELOCATABLE  29 APR 74   03:07:27     11       1         0                          [illegible]
   SDMRREPMAP                   MAP SYMB     2[illegible] APR 74   03:07:28     12                 6    5   0   1             1876
   SKEL          BASE           ELT SYMB     16 MAY 74   06:58:40     13               296    5   0   1             1882
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DMSUP                   ELT SYMB      15 APR 74   19:59:05   14        5   5  0  1    2178
DMRREPMAP     BASE      ELT SYMB      06 SEP 75   08:25:59   15       30   5  0  1    2183
SCHEMA        BASE      ASM PROC      06 SEP 75   08:27:09   16      510   5  0  1    2213
PACKET        BASE      ASM PROC      06 SEP 75   08:27:46   17      392   5  0  1    2723
DMRTAB        BASE      ASM PROC      06 SEP 75   [illegible] 18 [illegible] 5 0 1  [illegible]
[illegible]   BASE      ASM PROC      06 SEP 75   08:31:55   19      593   5  0  1    4608
DMSSGP        BASE      ASM PROC      06 SEP 75   09:44:41   20      175   5  1  2    5201
TIMER                   ASM SYMB      06 SEP 75   09:58:07   21       61   5  0  1    5376
QLINIT                  ASM SYMB      06 SEP 75   09:58:32   22      196   5  0  1    5437
SFINIT                  ASM SYMB      06 SEP 75   [illegible] 23 [illegible] 5 0 1  [illegible]
DTBSDMP2                ASM SYMB      06 SEP 75   09:59:33   24      214   5  0  1    5721
DYNDUMP                 ASM SYMB      06 SEP 75   09:59:58   25       41   5  0  1    5935
QUIREC                  ASM SYMB      06 SEP 75   10:00:26   26       58   5  0  1    5976
DMRACT                  ASM SYMB      06 SEP 75   10:00:53   27       30   5  0  1    6034
UPDATE                  ASM SYMB      06 SEP 75   10:01:19   28       31   5  0  1    6064
DMRCLR                  ASM SYMB      06 SEP 75   10:01:41   29       62   5  0  1    6095
LONGRECOVERY            ASM SYMB      06 SEP 75   10:02:07   30       16   5  0  1    6157
CHECKPOINT              ASM SYMB      06 SEP 75   10:03:15   31     1680   5  0  1    6173
TIPCOPY                 ASM SYMB      06 SEP 75   10:04:07   32       37   5  0  1    7853
SORTBUF                 ASM SYMB      06 SEP 75   10:04:32   33       35   5  0  1    7890
SGS                     RELOCATABLE   05 NOV 75   17:02:57   34   1    7               7925
PACKET                  ELT SYMB      18 DEC 75   17:00:42   35      274   5  0  1    7933
DMRREPMAP               ASM PROC      04 FEB 76   01:40:39   36      394   5  0  1    8207
SKEL                    ELT SYMB      19 MAR 76   17:39:21   37       31   5  0  1    8601
DMRTAB                  ELT SYMB      03 MAY 76   22:58:35   38      372   5  0  1    8632
DSWORK                  ASM PROC      14 JUN 76   21:26:59   39     1511   5  0  1    9004
SCHEMA                  ASM PROC      14 JUN 76   21:27:43   40      598   5  0  1   10515
DMSSGP                  ASM PROC      20 JUL 76   19:03:08   41      510   1  0  1   11113
LSINKR                  ASM PROC      20 JUL 76   21:02:46   42      172   5  0  1   11623
IV03                    RELOCATABLE   20 JUL 76   21:05:44   43   3    9              11795
IV08                    RELOCATABLE   20 JUL 76   21:13:04   44   4   37              11807
TC17                    RELOCATABLE   20 JUL 76   21:14:49   45   1    6              11848
TH09                    RELOCATABLE   20 JUL 76   21:18:22   46   1    5              11855
DH01                    RELOCATABLE   20 JUL 76   21:19:12   47   2   25              11861
DH17                    RELOCATABLE   20 JUL 76   21:20:17   48   3   51              11880
DH25                    RELOCATABLE   20 JUL 76   21:21:08   49   5   40              11942
I002                    RELOCATABLE   20 JUL 76   21:21:39   50   2    7              11987
RR01                    RELOCATABLE   20 JUL 76   21:22:09   51   2   14              11996
UT01                    RELOCATABLE   20 JUL 76   21:22:30   52   2   10              12012
GS02                    RELOCATABLE   20 JUL 76   21:23:34   53   3    3              12024
GS07                    RELOCATABLE   20 JUL 76   21:24:04   54   2   34              12030
TIMER                   RELOCATABLE   20 JUL 76   21:24:57   55   4   21              12066
TIMER                   RELOCATABLE   20 JUL 76   21:27:18   56   3   22              12091
QLINIT                  ABSOLUTE      20 JUL 76   21:27:27   57       25              12116
QLINIT                  RELOCATABLE   20 JUL 76   21:27:50   58   4   17              12141
SFINIT                  ABSOLUTE      20 JUL 76   21:27:59   59       19              12162
DTBSDMP1                RELOCATABLE   20 JUL 76   21:28:23   60   3   18              12181
DTBSDMP1                RELOCATABLE   20 JUL 76   21:29:11   61   3   24              12202
DTBSDMP2                ABSOLUTE      20 JUL 76   21:29:21   62       25              12229
DTBSDMP2                RELOCATABLE   20 JUL 76   21:29:43   63   3    7              12254
DYNDUMP                 ABSOLUTE      20 JUL 76   21:29:51   64       12              12264
DYNDUMP                 RELOCATABLE   20 JUL 76   21:30:15   65   3    5              12276
QUIREC                  ABSOLUTE      20 JUL 76   21:30:23   66       11              12284
QUIREC                  RELOCATABLE   20 JUL 76   21:30:46   67   2    2              12295
DMRACT                  ABSOLUTE      20 JUL 76   21:31:01   68        9              12299
DMRACT                  RELOCATABLE   20 JUL 76   21:31:27   69   3    4              12308
UPDATE                  ABSOLUTE      20 JUL 76   21:31:35   70       10              12315
UPDATE                  RELOCATABLE   20 JUL 76   21:31:56   71   3   12              12325
DMRCLR                  ABSOLUTE      20 JUL 76   21:32:10   72       16              12340
DMRCLR                  RELOCATABLE   20 JUL 76   21:32:36   73   2    2              12356
CHECKPOINT              ABSOLUTE      20 JUL 76   21:32:45   74        9              12360
CHECKPOINT              RELOCATABLE   20 JUL 76   21:34:56   75   3    3              12369
TIPCOPY                 ABSOLUTE      20 JUL 76   21:35:11   76       10              12375
TIPCOPY                 RELOCATABLE   20 JUL 76   21:35:38   77   2    8              12385
IV00                    ABSOLUTE      20 JUL 76   21:35:46   78       12              12395
IV01                    RELOCATABLE   09 AUG 76   09:01:24   79  24  531              12407
IV05                    RELOCATABLE   09 AUG 76   09:03:03   80   4   22              12962
IV06                    RELOCATABLE   09 AUG 76   09:06:39   81   3   16              12988
IV07                    RELOCATABLE   09 AUG 76   09:07:33   82   2    6              13007
IV09                    RELOCATABLE   09 AUG 76   09:08:18   83   2    5              13015
GS04                    RELOCATABLE   09 AUG 76   09:09:20   84   2    8              13022
LONGRECOVERY            RELOCATABLE   09 AUG 76   09:13:45   85   4   25              13032
LONGRECOVERY            RELOCATABLE   09 AUG 76   09:22:18   86   4  184              13061
SFINIT                  ABSOLUTE      09 AUG 76   09:22:57   87      138              13249
LINKER                  ABSOLUTE      09 AUG 76   09:27:31   88      439              13387
TC09                    RELOCATABLE   26 AUG 76   22:29:53   89   4   24              13826
TC13                    RELOCATABLE   26 AUG 76   22:31:08   90   2   26              13854
TC15                    RELOCATABLE   26 AUG 76   22:31:39   91   5   45              13882
                        RELOCATABLE   26 AUG 76   22:32:08   92   3   24              13932
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   RR05                              RELOCATABLE  26 AUG 76   22:32:35     93     5     43                          13964
   1V02                              RELOCATABLE  27 AUG 76   13:35:10     94     7    110                          14012
   DMR                               RELOCATABLE  27 AUG 76   13:35:13     95     3   2282                          14129
   DMR                               ABSOLUTE     27 AUG 76   13:40:30     96         1735                          16414
NEXT AVAILABLE LOCATION=                                                                                            18149

                    ASSEMBLER PROCEDURE TABLE

D NAME           LOCATION        LINK   D NAME           LOCATION        LINK   D NAME           LOCATION        LINK
  ATWENT              293321     39     • ATWENT              127930     18       BACKO               292312     39
• BACKO               126921     18       BACKI               292312     39     • BACKI               126921     18
  CALL                291137     39     • CALL                125796     18       CCT                 310340     40
• CCT                 144784     19     • CHB                 125691     18       CHB                 291032     39
• CHG                 125691     18       CHG                 291032     39       CLSI                310387     40
• CLSI                144831     19       CSTSQ               293081     39     • CSTSQ               127690     18
• DMRTAB               87226     18       DMRTAB              252118     39       DMRSSNAP            293833     39
• DMRSSNAP            128442     18       DMSSGP              325450     42       DSWORK              294481     40
• DSWORK              129085     19       ERROR               310222     40     • ERROR               144666     19
• EXITAD              127341     18       EXITAD              292732     39       EXITAI              292777     39
• EXITAI              127306     18       EXITO               292552     39     • EXITO               127161     18
  EXITI               292597     39     • EXITI               127206     18       FERR                310222     40
• FERR                144666     19       INCR                310266     40     • INCR                144710     19
  INDHIO              293471     39     • INDHIO              128080     18       JCALL               291967     39
• JCALL               126576     18       JE                  310010     40     • JE                  144454     19
  JEP                 310010     40     • JEP                 144454     19       JEZ                 310137     40
• JEZ                 144581     19       JG                  310010     40     • JG                  144454     19
• JLE                 144454     19       JLE                 310010     40       JNE                 310010     40
• JNE                 144454     19       JNEZ                310137     40     • JNEZ                144581     19
  JNV                 310137     40     • JNV                 144581     19       JNW                 310010     40
• JNW                 144454     19       JOP                 310010     40     • JOP                 144454     19
• JPV                 144581     19       JPV                 310137     40     • JW                  144454     19
  JW                  310010     40     • LBJ                 128382     18       LBJ                 293773     39
• NORBK               126921     18       NORBK               292312     39       NOTDMR              325450     42
  OPSI                310387     40     • OPSI                144831     19       PACKET              229802     36
• PACKET               76250     17       PARRAY              310478     40     • PARRAY              144922     19
• RCTGEN              128937     18       RCTGEN              294329     39       RDSI                310387     40
• RDSI                144831     19       RESTOR              292687     39     • RESTOR              127296     18
• RFSFCT              144216     19       RFSFCT              309772     40       RFSPOOL             309947     40
• RFSPOOL             144391     19     • RSTORA              127476     18     • RSTORA              292867     39
• RUQENT              127765     18       RUQENT              293156     39     • SAVEA               127431     18
  SAVEA               292822     39     • SAVEXA              127251     18       SAVEXA              292642     39
  SCHEMA              311170     41     • SCHEMA               61970     16     • SET                 144752     19
  SET                 310308     40     • SINCLR              127645     18       SINCLR              293036     39
  SINEXT              292976     39     • SINEXT              127585     18     • TSCELL              127521     18
  TSCELL              292912     39       WRSI                310387     40     • WRSI                144831     19

COBOL PROCEDURE TABLE EMPTY

FORTRAN PROCEDURE TABLE EMPTY

ENTRY POINT TABLE EMPTY

@PRT,TL F6.

LEE*F6(1)   ELEMENT TABLE

D  NAME         VERSION         TYPE          DATE        TIME      SEQ #  SIZE-PRE,TEXT (CYCLE WORD) PSRMODE  LOCATION
   EDITS                        ASM SYMB      21 FEB '1   10:43:02     1           121     5     0    1            1792
   EDITS                        RELOCATABLE   21 FEB '1   10:44:19     2      3      8                             1913
   EDITST                       ASM SYMB      21 FEB '1   10:43:43     3            55     5     0    1            1924
   EDITST                       RELOCATABLE   21 FEB '1   10:44:48  •  4      1      6                             1979
   SKEL         BASE            ELT SYMB      16 MAY 74   06:58:40     5           296     5     0    1            1986
   DMSUP                        ELT SYMB      15 APR 74   19:59:05     6             5     5     0    1            2282
   DMULIST                      ELT SYMB      22 NOV 74   20:33:20     7             6     5     0    1            2287
   [illegible]  BASE            ELT SYMB      26 SEP 75   16:28:41     8             9     5     0    1            2293
   UTMAPMT      BASE            ELT SYMB      26 SEP 75   16:28:41     9             9     5     0    1            2302
   UTMAPSEGR    BASE            ELT SYMB      26 SEP 75   16:28:48    10             1     5     0    1            2311
   UTMAPSEGA    BASE            ELT SYMB      26 SEP 75   16:28:48    11             1     5     0    1            2312
   DMUCOPY                      ELT SYMB      26 SEP 75   16:28:51    12            13     5     0    1            2313
   DMUCOPY      BASE            ELT SYMB      26 SEP 75   16:28:55    13            13     5     0    1            2326
   MAIN                         ELT SYMB      26 SEP 75   16:28:55    14            24     5     0    1            2339
   MAIN         BASE            ELT SYMB      26 SEP 75   16:28:56    15            24     5     0    1            2363
   MAIN-ASCII                   ELT SYMB      26 SEP 75   16:29:02    16            23     5     0    1            2387
   MAIN-ASCII   BASE            ELT SYMB      26 SEP 75   16:29:03    17            23     5     0    1            2410
   DMRDEFINES                   ELT SYMB      26 SEP 75   16:29:02    18             6     5     0    1            2433
   DMRDEFINES   BASE            ELT SYMB      26 SEP 75   16:29:03    19             6     5     0    1            2439
   DMRTABPLUS                   ELT SYMB      26 SEP 75   16:29:17    20           831     5     0    1            2445
   DMRTABPLUS   BASE            ELT SYMB      26 SEP 75   16:29:20    21           831     5     0    1            3276
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DSWORKPLUS         ELT SYMB      26 SEP 75   16:29:27    22             392   5   0   1        4107
DSWORKPLUS   BASE  ELT SYMB      26 SEP 75   16:29:29    23             392   5   0   1        4499
UTLTABPLUS         ELT SYMB      26 SEP 75   16:29:36    24              94   5   0   1        4891
UTLTABPLUS   BASE  ELT SYMB      26 SEP 75   16:29:34    25              94   5   0   1        4985
DMSSGP       BASE  ASM PROC      26 SEP 75   16:29:42    26             173   1   0   1        5079
DMU-PROCS    BASE  ASM PROC      26 SEP 75   16:29:58    27             209   1   0   1        5252
UTLTAB             ASM PROC      26 SEP 75   16:30:06    28             161   1   0   1        5461
UTLTAB       BASE  ASM PROC      26 SEP 75   16:30:09    29             161   1   0   1        5622
SCHEMA       BASE  ASM PROC      26 SEP 75   16:30:40    30             510   1   0   1        5783
PACKET       BASE  ASM PROC      26 SEP 75   16:31:25    31    [illegible]   1   0   1  [illegible]
DMUTAB             ASM PROC      26 SEP 75   16:32:05    32            1493   1   0   1        6605
DSWORK       BASE  ASM PROC      26 SEP 75   16:32:20    33             593   1   0   1        8178
AREALIST           ASM SYMB      26 SEP 75   16:56:20    34               8   5   0   1        8771
CD                 ASM SYMB      26 SEP 75   16:56:28    35               3   5   0   1        8779
CD                 RELOCATABLE   26 SEP 75   16:56:26    36      2        1                    8782
CERR               ASM SYMB      26 SEP 75   16:56:42    37              16   5   0   1        8785
CLOSE              ASM SYMB      26 SEP 75   16:57:00    38              11   5   0   1        8801
CODE               ASM SYMB      26 SEP 75   16:57:26    39              36   5   0   1        8812
CP                 ASM SYMB      26 SEP 75   16:57:34    40               3   5   0   1        8848
DMU-SCAN           ASM SYMB      26 SEP 75   16:58:00    41             443   5   0   1        8851
IMAGE              ASM SYMB      26 SEP 75   16:58:49    42              31   5   0   1        9294
SYNTAX             ASM SYMB      26 SEP 75   16:58:59    43             220   5   0   1        9325
UTILITY            ASM SYMB      26 SEP 75   16:59:37    44              28   5   0   1        9545
INIT               ASM SYMB      26 SEP 75   16:59:49    45              21   5   0   1        9573
INITIALIZE         ASM SYMB      26 SEP 75   17:00:10    46              16   5   0   1        9594
LEXICON            ASM SYMB      26 SEP 75   17:00:22    47              37   5   0   1        9610
CALCVER            ASM SYMB      26 SEP 75   17:01:09    48             486   5   0   1        9647
FDASC              ASM SYMB      26 SEP 75   17:01:29    49              56   5   0   1       10133
FDASC              RELOCATABLE   26 SEP 75   17:01:28    50      1        8                   10189
INFORS             ASM SYMB      26 SEP 75   17:01:34    51             141   5   0   1       10198
INFORS             RELOCATABLE   26 SEP 75   17:01:42    52      2       12                   10339
PREPRO             ASM SYMB      26 SEP 75   17:01:49    53             171   5   0   1       10353
PREPRO             RELOCATABLE   26 SEP 75   17:01:55    54      2       22                   10524
SDFI               ASM SYMB      26 SEP 75   17:01:55    55              74   5   0   1       10548
SDFI               RELOCATABLE   26 SEP 75   17:02:01    56      1        9                   10622
SDFO               ASM SYMB      26 SEP 75   17:02:01    57              33   5   0   1       10632
SDFO               RELOCATABLE   26 SEP 75   17:02:02    58      1        4                   10665
SIRASM             ASM SYMB      26 SEP 75   17:02:13    59             387   5   0   1       10670
PAGCOM             ASM SYMB      26 SEP 75   17:02:47    60             103   5   0   1       11057
PAGE               ASM SYMB      26 SEP 75   17:03:05    61               9   5   0   1       11160
PAGEXP             ASM SYMB      26 SEP 75   17:03:28    62              80   5   0   1       11169
PATCH              ASM SYMB      26 SEP 75   17:03:52    63              58   5   0   1       11249
PRINT              ASM SYMB      26 SEP 75   17:04:25    64             412   5   0   1       11307
DUMP               ASM SYMB      26 SEP 75   17:05:05    65             155   5   0   1       11719
PRT10              ASM SYMB      26 SEP 75   17:05:32    66              98   5   0   1       11874
PRT20              ASM SYMB      26 SEP 75   17:05:50    67              33   5   0   1       11972
PRT30              ASM SYMB      26 SEP 75   17:06:16    68              83   5   0   1       12005
SELREC             ASM SYMB      26 SEP 75   17:06:51    69             417   5   0   1       12088
CALLPA             ASM SYMB      26 SEP 75   17:07:17    70              90   5   0   1       12505
SV12               ASM SYMB      26 SEP 75   17:07:42    71             155   5   0   1       12595
DBKPRT             ASM SYMB      26 SEP 75   17:08:13    72             183   5   0   1       12750
CVDIV              ASM SYMB      26 SEP 75   17:08:22    73              16   5   0   1       12933
CVDIV              RELOCATABLE   26 SEP 75   17:08:23    74      1        2                   12949
BINFD              ASM SYMB      26 SEP 75   17:08:27    75              17   5   0   1       12952
BINFD              RELOCATABLE   26 SEP 75   17:08:27    76      1        2                   12969
STAT               ASM SYMB      26 SEP 75   17:08:41    77             173   5   0   1       12972
USER               ASM SYMB      26 SEP 75   17:09:08    78             158   5   0   1       13145
AEDITS             ASM SYMB      26 SEP 75   17:09:19    79             155   5   0   1       13303
AEDITS             RELOCATABLE   26 SEP 75   17:09:26    80      3        9                   13458
RRDT               ASM SYMB      26 SEP 75   17:09:26    81               1   5   0   1       13470
RRDT               RELOCATABLE   26 SEP 75   17:09:26    82      1        0                   13471
SAV                ASM SYMB      26 SEP 75   17:09:33    83               1   5   0   1       13472
SAV                RELOCATABLE   26 SEP 75   17:09:33    84      1        0                   13473
SDT                ASM SYMB      26 SEP 75   17:09:47    85              24   5   0   1       13474
STUFF              ASM SYMB      26 SEP 75   17:09:53    86              11   5   0   1       13498
SVCONV             ASM SYMB      26 SEP 75   17:09:59    87               6   5   0   1       13509
SVCONV             RELOCATABLE   26 SEP 75   17:10:00    88      1        1                   13515
SV01               ASM SYMB      26 SEP 75   17:13:42    89             102   5   0   1       13517
SV02               ASM SYMB      26 SEP 75   17:14:10    90              62   5   0   1       13619
SV02               RELOCATABLE   26 SEP 75   17:14:10    91      3        7                   13681
SV03               ASM SYMB      26 SEP 75   17:14:28    92              31   5   0   1       13691
SV04               ASM SYMB      26 SEP 75   17:14:56    93              39   5   0   1       13722
SV05               ASM SYMB      26 SEP 75   17:15:21    94              62   5   0   1       13761
SV06               ASM SYMB      26 SEP 75   17:15:33    95              13   5   0   1       13823
SV07               ASM SYMB      26 SEP 75   17:15:48    96              13   5   0   1       13836
SV07               RELOCATABLE   26 SEP 75   17:15:49    97      1        2                   13849
SV08               ASM SYMB      26 SEP 75   17:16:06    98              26   5   0   1       13852
SV09               ASM SYMB      26 SEP 75   17:16:13    99               1   5   0   1       13878
SV10               ASM SYMB      26 SEP 75   17:16:33   100              72   5   0   1       13879
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SV10         RELOCATABLE  26 SEP 75  17:16:39  101   1     3                 13901
SV11         ASM SYMB     26 SEP 75  17:16:53  102        28    5   0   1    13905
SV13         ASM SYMB     26 SEP 75  17:17:06  103        13    5   0   1    13933
SV13         RELOCATABLE  26 SEP 75  17:17:07  104   3     4                 13946
SV16         ASM SYMB     26 SEP 75  17:17:26  105        79    5   0   1    13953
SV17         ASM SYMB     26 SEP 75  17:17:46  106        22    5   0   1    14032
SV19         ASM SYMB     26 SEP 75  17:17:52  107         9    5   0   1    14054
SV20         ASM SYMB     26 SEP 75  17:18:17  108        78    5   0   1    14063
SV20         RELOCATABLE  26 SEP 75  17:18:23  109   3    22                 14141
SV21         ASM SYMB     26 SEP 75  17:18:38  110        18    5   0   1    14166
SV25         ASM SYMB     26 SEP 75  17:18:58  111        36    5   0   1    14184
SV26         ASM SYMB     26 SEP 75  17:19:18  112        22    5   0   1    14220
SV99         ASM SYMB     26 SEP 75  17:19:36  113        47    5   0   1    14242
CERR         RELOCATABLE  26 SEP 75  19:19:19  114   1     3                 14289
INITIALIZE   RELOCATABLE  26 SEP 75  19:22:11  115   1     3                 14293
PAGCOM       RELOCATABLE  26 SEP 75  19:23:28  116   1    23                 14297
PAGE         RELOCATABLE  26 SEP 75  19:23:43  117   1     2                 14321
PATCH        RELOCATABLE  26 SEP 75  19:24:28  118   1    11                 14324
DUMP         RELOCATABLE  26 SEP 75  19:25:38  119   3    14                 14336
PRT10        RELOCATABLE  26 SEP 75  19:26:00  120   4    12                 14358
PRT20        RELOCATABLE  26 SEP 75  19:26:12  121   2     3                 14374
PRT30        RELOCATABLE  26 SEP 75  19:26:37  122   3    11                 14379
CALLPA       RELOCATABLE  26 SEP 75  19:27:25  123   3    15                 14393
SV12         RELOCATABLE  26 SEP 75  19:27:51  124   4    18                 14411
SV03         RELOCATABLE  26 SEP 75  19:29:56  125   2     3                 14433
SV06         RELOCATABLE  26 SEP 75  19:30:55  126   1     2                 14438
SV16         RELOCATABLE  26 SEP 75  19:31:35  127   2     9                 14441
SV17         RELOCATABLE  26 SEP 75  19:31:48  128   1     4                 14452
SV19         RELOCATABLE  26 SEP 75  19:31:58  129   2     2                 14457
SV21         RELOCATABLE  26 SEP 75  19:32:12  130   1     3                 14461
SV25         RELOCATABLE  26 SEP 75  19:32:34  131   2     6                 14465
SV26         RELOCATABLE  26 SEP 75  19:32:47  132   1     3                 14473
UP           ELT SYMB     30 SEP 75  06:34:40  133       112    5   0   1    14477
DOWN         ELT SYMB     30 SEP 75  06:34:40  134        58    5   0   1    14589
LOADSG       ELT SYMB     07 OCT 75  09:47:41  135         1    5   0   1    14647
UTMAPSEGR    ELT SYMB     07 OCT 75  09:50:55  136         1    5   0   1    14648
CLOSE        RELOCATABLE  07 OCT 75  09:51:17  137         2                 14649
SV11         RELOCATABLE  07 OCT 75  09:53:30  138   1     4                 14652
SIRTAB       ELT SYMB     10 OCT 75  16:20:50  139         1    5   0   1    14657
UTMAPST      ELT SYMB     10 OCT 75  16:25:21  140        10    5   0   1    14658
UTMAPHT      ELT SYMB     10 OCT 75  16:25:20  141        10    5   0   1    14668
UTMAPSEGA    ELT SYMB     10 OCT 75  16:25:22  142        10    5   0   1    14678
SIRASH       RELOCATABLE  10 OCT 75  16:47:49  143   7    67                 14688
SIRTAB       RELOCATABLE  10 OCT 75  16:47:50  144  10     6                 14762
SGS          ELT SYMB     18 DEC 75  17:00:42  145       274    5   0   1    14778
LOADSG       RELOCATABLE  13 JAN 76  17:21:19  146   6     6                 15052
PACKET       ASM PROC     04 FEB 76  01:40:48  147       394    5   0   1    15064
SKEL         ELT SYMB     03 MAY 76  22:58:35  148       372    5   0   1    15458
DSWORK       ASM PROC     14 JUN 76  21:27:50  149       598    5   0   1    15830
DMRTAB       ASM PROC     14 JUN 76  21:41:02  150      1511    5   0   1    16428
DOWN         RELOCATABLE  14 JUN 76  21:42:23  151   2    16                 17939
UP           RELOCATABLE  14 JUN 76  21:44:06  152   2    31                 17957
DMU-PROCS    ASM PROC     20 JUL 76  19:02:30  153       210    1   0   1    17990
SCHEMA       ASM PROC     20 JUL 76  19:03:19  154       510    1   0   1    18200
DMSSGP       ASM PROC     20 JUL 76  21:36:17  155       172    5   0   1    18710
AREALIST     RELOCATABLE  20 JUL 76  21:37:08  156   1     1                 18882
CODE         RELOCATABLE  20 JUL 76  21:37:46  157   1     5                 18884
CP           RELOCATABLE  20 JUL 76  21:37:53  158   1     0                 18890
IMAGE        RELOCATABLE  20 JUL 76  21:39:56  159   3     5                 18891
SYNTAX       RELOCATABLE  20 JUL 76  21:40:55  160   4    54                 18899
UTILITY      RELOCATABLE  20 JUL 76  21:42:00  161   3     4                 18957
INIT         RELOCATABLE  20 JUL 76  21:42:16  162   3     4                 18964
LEXICON      RELOCATABLE  20 JUL 76  21:42:30  163   1     8                 18971
CALCVER      RELOCATABLE  20 JUL 76  21:43:59  164   4    54                 18980
PAGEXP       RELOCATABLE  20 JUL 76  21:44:43  165   1    15                 19038
SELREC       RELOCATABLE  20 JUL 76  21:47:14  166   2    52                 19054
STAT         RELOCATABLE  20 JUL 76  21:48:53  167   3    26                 19108
USER         RELOCATABLE  20 JUL 76  21:49:39  168   2     2                 19137
SDT          RELOCATABLE  20 JUL 76  21:50:06  169   1     3                 19141
SV01         RELOCATABLE  20 JUL 76  21:51:00  170   4    14                 19145
SV04         RELOCATABLE  20 JUL 76  21:51:51  171   2    11                 19163
SV08         RELOCATABLE  20 JUL 76  21:52:15  172   2     4                 19176
SV09         RELOCATABLE  20 JUL 76  21:52:18  173   1     0                 19182
SV99         RELOCATABLE  20 JUL 76  21:52:40  174   2     2                 19183
DMU-SCAN     RELOCATABLE  09 AUG 76  09:31:25  175   4    59                 19187
PRINT        RELOCATABLE  09 AUG 76  09:39:17  176   6    70                 19250
STUFF        RELOCATABLE  09 AUG 76  09:40:24  177   3     1                 19326
SV05         RELOCATABLE  09 AUG 76  09:43:43  178   2     6                 19330
DBKPRT       RELOCATABLE  26 AUG 76  22:33:51  179   3    18                 19338
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NEXT AVAILABLE LOCATION-                                                                                    19359

                              ASSEMBLER PROCEDURE TABLE

D NAME       LOCATION   LINK     D NAME       LOCATION   LINK     D NAME       LOCATION   LINK
  ARTGET       161162     29     • ARTGET       156659     28       ATWENT       501193    150
• ATWENT       227890     32       BACKO        500184    150     • BACKO        226881     32
• BACKO        161712     29     • BACKO        157209     28       BACKI        500184    150
• BACKI        226881     32     • BACKI        161733     29     • BACKI        157225     28
  BLANK        506873    153     • BLANK        150193     27       BOTTOM       161838     29
• BOTTOM       157330     28       CALL         499009    150     • CALL         225706     32
• CALL         161683     29     • CALL         157175     28       CALLCOM      160721     29
• CALLCOM      156213     28       CALLDMR      160679     29     • CALLDMR      156166     28
  CALLPS       160590     29     • CALLPS       156082     28       CCT          507755    153
• CCT          459160    149     • CCT          244744     33     • CCT          151075     27
  CHB          498904    150     • CHB          225601     32       CHG          498904    150
• CHG          225601     32       CLSI         507802    153     • CLSI         459207    149
• CLSI         244791     33     • CLSI         151122     27       CODE         508335    153
• CODE         151655     27       CSTSQ        500953    150     • CSTSQ        227650     32
  DDL          503789    153     • DDL          147125     27       DMRTAB       459990    150
• DMRTAB       187186     32       DMRSSNAP     501705    150     • DMRSSNAP     228402     32
  DMSSGP       523886    155     • DMSSGP       142218     26     • DUMP         151292     27
  DUMP         507972    153       DSPKT        508078    153     • DSPKT        151398     27
  DSWORK       443301    149     • DSWORK       229045     33     • ENTER        151720     27
  ENTER        508400    153       ENTERH       508400    153     • ENTERH       151720     27
  ERROR        506755    153     • ERROR        459042    149     • ERROR        244626     33
• ERROR        150075     27       EXITAO       500604    150     • EXITAO       227301     32
  EXITAI       500649    150     • EXITAI       227346     32       EXITO        500424    150
• EXITO        227121     32     • EXITO        161754     29     • EXITO        157246     28
  EXITI        500469    150     • EXITI        227166     32     • EXITI        161775     29
• EXITI        157267     28       FDP          507340    153     • FDP          150660     27
  FERR         506755    153     • FERR         150075     27     • FERR         459042    149
• FERR         244626     33     • INAUT        156841     28       INAUT        161349     29
  INCR         506799    153     • INCR         459086    149     • INCR         244670     33
• INCR         150119     27       INDHIO       501343    150     • INDHIO       228040     32
• INMAN        157024     28       INMAN        161532     29       JCALL        499839    150
• JCALL        226536     32       JE           506543    153     • JE           458830    149
  JE           244414     33     • JE           149863     27       JEP          506543    153
  JEP          458830    149     • JEP          244414     33     • JEP          149863     27
  JEZ          506670    153     • JEZ          149990     27     • JEZ          458957    149
  JEZ          244541     33       JG           506543    153     • JG           149863     27
  JG           458830    149     • JG           244414     33       JLE          506543    153
  JLE          458830    149     • JLE          244414     33     • JLE          149863     27
  JNE          506543    153     • JNE          458830    149     • JNE          244414     33
  JNE          149863     27     • JNEZ         149990     27       JNEZ         506670    153
• JNEZ         458957    149     • JNEZ         244541     33       JNV          506670    153
• JNV          149990     27     • JNV          458957    149     • JNV          244541     33
  JNW          506543    153     • JNW          149863     27     • JNW          458830    149
• JNW          244414     33       JOP          506543    153     • JOP          149863     27
• JOP          458830    149     • JOP          244414     33       JPV          506670    153
• JPV          149990     27     • JPV          458957    149     • JPV          244541     33
  JUMP         508400    153     • JUMP         151720     27       JW           506543    153
• JW           244414     33     • JW           458830    149     • JW           149863     27
  LBJ          501645    150     • LBJ          228342     32       LEXDEF       508470    153
• LEXDEF       151790     27       LEXDEFA      508470    153     • LEXDEFA      151790     27
  LEXTAB       508888    153     • LEXTAB       152208     27       LI           507405    153
• LI           150725     27       LI2          507405    153     • LI2          150725     27
• LXIX2        156192     28       LXIX2        160650     29     • MOVE         156773     28
  MOVE         161281     29       NOISE        508289    153     • NOISE        151609     27
• NORBK        226881     32       NORBK        500184    150       NOTDMR       523886    155
• NOTDMR       142218     26       OCODE        508335    153     • OCODE        151655     27
• OPSI         244791     33       OPSI         507802    153     • OPSI         151122     27
• OPSI         459207    149     • PACKET       176210     31       PACKET       421798    147
• PARRAY       244882     33       PARRAY       459248    149       PSEMA        507153    153
• PSEMA        150473     27     • PSEMB        150473     27       PSEMB        507153    153
  PSEMC        507153    153     • PSEMC        150473     27       PSRINT       507904    153
• PSRINT       151224     27     • RCTGEN       228897     32       RCTGEN       502200    150
• RDTAUT       156311     28       RDTAUT       160819     29     • RDTGET       156598     28
  RDTGET       161106     29       RDTMAN       160819     29     • RDTMAN       156311     28
  RDTOWN       160819     29     • RDTOWN       156311     28       RDTREL       161245     29
• RDTREL       156737     28     • RDTSCH       156311     28       RDTSCH       160819     29
  RDSI         507802    153     • RDSI         151122     27     • RDSI         459207    149
• RDSI         244791     33       REQ          508289    153     • REQ          151609     27
• RESTOR       157309     28     • RESTOR       161817     29     • RESTOR       227256     32
  RESTOR       500559    150     • RFSFCT       244176     33       RFSFCT       458592    149
• RFSPOOL      244351     33       RFSPOOL      458767    149     • RSTORA       227436     32
  RSTORA       500739    150       RUQENT       501020    150     • RUQENT       227725     32
  SAVEA        500694    150     • SAVEA        227391     32     • SAVEXA       157280     28
• SAVEXA       227211     32     • SAVEXA       161796     29       SAVEXA       500519    150
• SC              151571    27     SC           508251   153       SCHEMA          509606   154
• SCHEMA          161930    30   • SDTGET       154530    28       SDTGET          161096    29
• SDTREL          156706    28     SDTREL       161219    29       SET             506891   153
• SET             150161    27   • SET          459128   149     • SET             249712    33
  SINCLR          500708   150   • SINCLR       227605    32     • SINEXT          227545    32
  SINEXT          500898   150   • TCP          150514    27       TCP             507199   153
  TEST            508335   153   • TEST         151655    27     • TESTH           151655    27
  TESTH           508335   153   • TRINT        150252    27       TRINT           506932   153
• TRINT1          150252    27     TRINT1       506932   153     • TRUNC           150349    27
  TRUNC           507029   153     TRUNC1       507029   153     • TRUNC1          150349    27
• TSCELL          227981    32     TSCELL       500789   150       UTTAB           157922    29
• UTTAB           152914    28     WRS1         507802   153     • WRS1            249791    33
• WRS1            151122    27   • WRS1         459207   149     • ZERO            150193    27
  ZERO            506873   153

COBOL PROCEDURE TABLE EMPTY

FORTRAN PROCEDURE TABLE EMPTY

ENTRY POINT TABLE EMPTY

@PRT,TL F7.

LEE*F7(1)   ELEMENT TABLE

D  NAME           VERSION      TYPE          DATE        TIME      SEQ #  SIZE-PRE,TEXT (CYCLE WORD) PSRMODE  LOCATION
   DDLLIST                     ELT SYMB     24 APR 74   02:33:58     1              2     5    0    1           1792
 . SKEL           BASE         ELT SYMB     16 MAY 74   06:58:40     2            296     5    0    1           1794
   DMSUP                       ELT SYMB     15 APR 74   19:59:05     3              5     5    0    1           2090
   DDL-MAP                     ELT SYMB     26 SEP 75   16:28:24     4              6     5    0    1           2095
   DDL-MAP        BASE         ELT SYMB     26 SEP 75   16:28:25     5              6     5    0    1           2101
   SCHEMA         BASE         ASM PROC     26 SEP 75   16:30:28     6            510     1    0    1           2107
   RFSPROC                     ASM PROC     26 SEP 75   16:31:06     7             27     1    0    1           2617
   RFSPROC        BASE         ASM PROC     26 SEP 75   16:31:08     8             27     1    0    1           2644
   DDL-PROCS                   ASM PROC     26 SEP 75   16:32:53     9            252     1    0    1           2671
   DDL-PROCS      BASE         ASM PROC     26 SEP 75   16:32:57    10            252     1    0    1           2923
   FILE-HANDLER                ASM SYMB     26 SEP 75   16:33:06    11            151     5    0    1           3175
   FILE-HANDLER                RELOCATABLE  26 SEP 75   16:33:10    12      3      24                           3326
   RFPS                        ASM SYMB     26 SEP 75   16:33:18    13            159     5    0    1           3353
   RFPS                        RELOCATABLE  26 SEP 75   16:33:18    14      2       8                           3512
   INIT                        ASM SYMB     26 SEP 75   16:33:32    15             48     5    0    1           3522
   DDL-SCAN                    ASM SYMB     26 SEP 75   16:34:43    16           2959     5    0    1           3570
   FIXUP                       ASM SYMB     26 SEP 75   16:37:08    17            343     5    0    1           6529
   IMAGE                       ASM SYMB     26 SEP 75   16:37:32    18            136     5    0    1           6872
   IMAGE                       RELOCATABLE  26 SEP 75   16:37:41    19      5      26                           7008
   LEXICON                     ASM SYMB     26 SEP 75   16:37:53    20             37     5    0    1           7039
   LEXICON                     RELOCATABLE  26 SEP 75   16:38:00    21      1      12                           7076
   STUFF                       ASM SYMB     26 SEP 75   16:38:06    22             41     5    0    1           7089
   STUFF                       RELOCATABLE  26 SEP 75   16:38:12    23      3       9                           7130
   SYNTAX                      ASM SYMB     26 SEP 75   16:38:25    24            312     5    0    1           7142
   SYNTAX                      RELOCATABLE  26 SEP 75   16:38:59    25      6      78                           7454
   LOGIC-VERIFY                ASM SYMB     26 SEP 75   16:39:58    26           2315     5    0    1           7538
   PREPRO                      RELOCATABLE  30 SEP 75   12:56:39    27      2      26                           9853
   SGS                         ELT SYMB     18 DEC 75   17:00:42    28            274     5    0    1           9881
   SKEL                        ELT SYMB     03 MAY 76   22:58:35    29            372     5    0    1          10155
   FIXUP                       RELOCATABLE  03 MAY 76   23:04:40    30      7      47                          10527
   SCHEMA                      ASM PROC     20 JUL 76   19:02:49    31            510     1    0    1          10581
   INIT                        RELOCATABLE  20 JUL 76   19:04:07    32      5      15                          11091
   DDL-SCAN                    RELOCATABLE  20 JUL 76   19:08:35    33     10     409                          11111
   LOGIC-VERIFY                RELOCATABLE  20 JUL 76   19:15:00    34      5     465                          11530
   DDL                         ABSOLUTE     20 JUL 76   19:15:53    35            850                          12000
NEXT AVAILABLE LOCATION-                                                                                        12850

                          ASSEMBLER PROCEDURE TABLE

D NAME           LOCATION     LINK   D NAME           LOCATION      LINK   D NAME           LOCATION     LINK
  BLANK             85597      10    • BLANK             78591        9      CCT               86327      10
• CCT               79271       9      CLS1              86379       10    • CLS1              79318       9
  CODE              86936      10    • CODE              79880        9      DDL               81913      10
• DDL               79857       9      DUMP              86579       10    • DUMP              79518       9
  DIMSG       [illegible]      10    • DIMSG       [illegible]        9      DSPKT       [illegible]      10
• DSPKT             79629       9      ENTER             87001       10    • ENTER             79945       9
  ENTERH            87001      10    • ENTERH            79945        9      ERROR             85979      10
• ERROR             78923       9      FDP               86069       10    • FDP               79008       9
  FERR              85979      10    • FERR              78923        9      INCR              85523      10
• INCR        [illegible]       9    • JE          [illegible]        9      [illegible] [illegible]    10
• JEP               78211       9      JEP               85267       10    • JEZ               78338       9
  JEZ               85399      10      JG                85267       10    • JG                78211       9
 • JLE             78211    9        JLE           85267   10       JNE          85267   10
 • JNE             78211    9        JNEZ          85394   10     • JNEZ         78338    9
 • JNV             78338    9        JNV           85394   10     • [illegible]  78211    9
   JNW             85267   10        JOP           85267   10     • JOP          78211    9
 • JPV             78338    9        JPV           85394   10       JUMP         87001   10
 • JUMP            79995    9      • JW            78211    9       JW           85267   10
   LEXDEF          87071   10      • LEXDEF        80015    9       LEXDEFA      87071   10
 • LEXDEFA         80015    9        LEXTAB        87989   10     • LEXTAB       80411    9
   LI              86197   10      • LI            79091    9     • LI2          79091    9
   LI2             86197   10        NOISE         86890   10     • NOISE        79834    9
 • OCODE           79880    9        OCODE         86936   10       OPSI         86374   10
 • OPSI            79318    9      • PSEMA         78821    9       PSEMA        85877   10
   PSEMB           85877   10      • PSEMB         78821    9       PSEMC        85877   10
 • PSEMC           78821    9      • PSRINT        79950    9       PSRINT       86506   10
   RDSI            86374   10      • RDSI          79318    9       RDSII        86374   10
 • RDSII           79318    9      • REQ           79839    9       REQ          86890   10
   RFPSC           74711    8      • RFPSC         73955    7       RFPSO        74521    8
 • RFPSO           73765    7        RFPSR         74711    8     • RFPSR        73955    7
 • RFPSW           73955    7        RFPSW         74711    8       RFSFCT       74150    8
 • RFSFCT          73394    7        RFSPOOL       74325    8     • RFSPOOL      73569    7
 • SC              79796    9        SC            86852   10       SCHEMA      296274   31
 • SCHEMA          59002    6      • SET           78509    9       SET          85565   10
   TCP             85918   10      • TCP           78862    9     • TEST         79880    9
   TEST            86936   10        TESTH         86936   10     • TESTH        79880    9
   TRINT           85656   10      • TRINT         78600    9     : TRINTI       78600    9
   TRINTI          85656   10        TRUNC         85753   10     • TRUNC        78697    9
 • TRUNCI          78697    9        TRUNCI        85753   10     • WRSI         79318    9
   WRSI            86374   10        WRSII         86374   10     • WRSII        79318    9
 • ZERO            78591    9        ZERO          85597   10
COBOL PROCEDURE TABLE EMPTY

FORTRAN PROCEDURE TABLE EMPTY

ENTRY POINT TABLE EMPTY

@PRT,TL FB.

LEE*FB(1)   ELEMENT TABLE

D  NAME       VERSION           TYPE         DATE        TIME      SEQ #  SIZE-PRE,TEXT (CYCLE WORD) PSRMODE  LOCATION
   BPOOL      BBCOB17      RELOCATABLE    02 APR 69   09:49:34      1      1     3                             1792
   BBCLOR     BBCOB17      RELOCATABLE    03 JAN 73   16:12:49      2      2     2                             1796
   BBCOM      BBCOB17      RELOCATABLE    03 JAN 73   16:13:06      3      4    12                             1800
   BBCLOF     BBCOB17      RELOCATABLE    03 JAN 73   16:56:19      4      2     3                             1816
   BBOPEN     BBCOB17      RELOCATABLE    03 JAN 73   16:56:15      5      2     8                             1821
   BBOUT      BBCOB17      RELOCATABLE    03 JAN 73   16:57:07      6      3     9                             1831
   BBIN       BBCOB17      RELOCATABLE    05 JAN 73   19:07:15      7      3    15                             1843
   BBINOT     BBCOB17      RELOCATABLE    05 JAN 73   19:09:19      8      3     9                             1861
   DMLLIST                 ELT SYMB       24 APR 74   02:39:01      9            2     5    0    1              1873
   SKEL       BASE         ELT SYMB       16 MAY 74   06:58:40     10          296     5    0    1              1875
   DMSUP                   ELT SYMB       15 APR 74   19:59:05     11            5     5    0    1              2171
   DMLMAP                  ELT SYMB       26 SEP 75   16:28:30     12            5     5    0    1              2176
   DMLMAP     BASE         ELT SYMB       26 SEP 75   16:28:31     13            5     5    0    1              2181
   SCHEMA     BASE         ASM PROC       26 SEP 75   16:31:00     14          510     1    0    1              2186
   COPROC                  ASM PROC       26 SEP 75   16:31:12     15          130     1    0    1              2696
   COPROC     BASE         ASM PROC       26 SEP 75   16:31:19     16          130     1    0    1              2826
   DSWORK     BASE         ASM PROC       26 SEP 75   16:32:46     17          593     1    0    1              2956
   NNLT                    ASM SYMB       26 SEP 75   16:43:09     18           74     5    0    1              3549
   NNLT                    RELOCATABLE    26 SEP 75   16:43:08     19      2     9                             3623
   DRMWRT                  ASM SYMB       26 SEP 75   16:43:14     20           31     5    0    1              3634
   DRMWRT                  RELOCATABLE    26 SEP 75   16:43:13     21      2     6                             3665
   ITREAD                  ASM SYMB       26 SEP 75   16:43:16     22           11     5    0    1              3673
   ITREAD                  RELOCATABLE    26 SEP 75   16:43:20     23      1     2                             3684
   ITWRIT                  ASM SYMB       26 SEP 75   16:43:20     24           15     5    0    1              3687
   ITWRIT                  RELOCATABLE    26 SEP 75   16:43:22     25      1     4                             3702
   INCLUD                  ASM SYMB       26 SEP 75   16:43:26     26          166     5    0    1              3707
   INCLUD                  RELOCATABLE    26 SEP 75   16:43:35     27      3    35                             3873
   NAMETB                  ASM SYMB       26 SEP 75   16:43:39     28            3     5    0    1              3911
   NAMETB                  RELOCATABLE    26 SEP 75   16:43:35     29      2     1                             3914
   NLIT                    ASM SYMB       26 SEP 75   16:43:40     30          234     5    0    1              3917
   NLIT                    RELOCATABLE    26 SEP 75   16:43:49     31      4    28                             4151
   SCAN                    ASM SYMB       26 SEP 75   16:43:55     32          394     5    0    1              4183
   PRCDIV                  ASM SYMB       26 SEP 75   16:44:07     33          175     5    0    1              4577
   PRCDIV                  RELOCATABLE    26 SEP 75   16:44:12     34      9    30                             4752
   DMLSGP                  ASM SYMB       26 SEP 75   16:44:21     35            6     5    0    1              4791
   DMLSGP                  RELOCATABLE    26 SEP 75   16:44:19     36      1     1                             4794
   COMSEC                  ASP SYMB       26 SEP 75   16:44:27     37          170     5    0    1              4798
COMSEC          RELOCATABLE  26 SEP 75   16:44:33   38   2    36                4958
COOR            ASM SYMB     26 SEP 75   16:44:39   39        99   5   0   1    4996
COOR            RELOCATABLE  26 SEP 75   16:44:41   40   5    19                5095
DATCOM          ASM SYMB     26 SEP 75   16:44:47   41        27   5   0   1    5114
DCMNTS          ASM SYMB     26 SEP 75   16:44:52   42        94   5   0   1    5141
DCMNTS          RELOCATABLE  26 SEP 75   16:44:59   43   1    37                5235
DGEND           ASM SYMB     26 SEP 75   16:45:05   44       460   5   0   1    5273
IEDDIV          ASM SYMB     26 SEP 75   16:45:20   45       118   5   0   1    5733
IEDDIV          RELOCATABLE  26 SEP 75   16:45:25   46   4    23                5851
INVOKE          ASM SYMB     26 SEP 75   16:45:39   47       305   5   0   1    5878
LEVEL           ASM SYMB     26 SEP 75   16:45:51   48         2   6   0   1    6183
LVENO           ASM SYMB     26 SEP 75   16:45:59   49       221   5   0   1    6185
MAIN            ASM SYMB     26 SEP 75   16:46:11   50       219   5   0   1    6406
PDMIFS          ASM SYMB     26 SEP 75   16:46:38   51       462   5   0   1    6625
PDMIFS          RELOCATABLE  26 SEP 75   16:46:51   52   6    73                7087
PDOCRI          ASM SYMB     26 SEP 75   16:46:52   53        89   5   0   1    7166
PDOCRI          RELOCATABLE  26 SEP 75   16:46:58   54   3    16                7255
PGHDDM          ASM SYMB     26 SEP 75   16:47:02   55        71   5   0   1    7274
PGHDDM          RELOCATABLE  26 SEP 75   16:47:05   56   3    12                7345
PHASE2          ASM SYMB     26 SEP 75   16:47:09   57        70   5   0   1    7360
PHASE2          RELOCATABLE  26 SEP 75   16:47:12   58   2    11                7430
PICSIZ          ASM SYMB     26 SEP 75   16:47:15   59        58   5   0   1    7443
PICSIZ          RELOCATABLE  26 SEP 75   16:47:18   60   1     9                7501
PRDCOM          ASM SYMB     26 SEP 75   16:47:18   61        46   5   0   1    7511
PRDCOM          RELOCATABLE  26 SEP 75   16:47:23   62   3     8                7557
RECSND          ASM SYMB     26 SEP 75   16:47:29   63       109   5   0   1    7568
RECSND          RELOCATABLE  26 SEP 75   16:47:31   64   3    19                7677
REFRMT          ASM SYMB     26 SEP 75   16:47:36   65       201   5   0   1    7699
REFRMT          RELOCATABLE  26 SEP 75   16:47:38   66   1    30                7900
RELGEN          ASM SYMB     26 SEP 75   16:47:42   67        88   5   0   1    7931
RELGEN          RELOCATABLE  26 SEP 75   16:47:48   68   2    14                8019
LEX             ASM SYMB     26 SEP 75   16:47:55   69       374   5   0   1    8035
LEX             RELOCATABLE  26 SEP 75   16:48:04   70   1    50                8409
SNMTBL          ASM SYMB     26 SEP 75   16:48:08   71        54   5   0   1    8460
PREPRO          RELOCATABLE  30 SEP 75   12:56:52   72   2    26                8519
SCAN            RELOCATABLE  09 DEC 75   17:09:52   73   8    57                8542
SGS             ELT SYMB     18 DEC 75   17:00:42   74       274   5   0   1    8607
SKEL            ELT SYMB     03 MAY 76   22:58:35   75       372   6   0   1    8881
MAIN            RELOCATABLE  20 MAY 76   11:18:25   76   8    44                9253
DSWORK          ASM PROC     14 JUN 76   21:28:07   77       598   5   0   1    9305
SCHEMA          ASM PROC     20 JUL 76   19:03:41   78       510   1   0   1    9903
DATCOM          RELOCATABLE  20 JUL 76   19:16:14   79   5     9               10413
DGEND           RELOCATABLE  20 JUL 76   19:16:29   80   4    55               10422
INVOKE          RELOCATABLE  20 JUL 76   19:17:04   81   6    51               10481
LEVEL           RELOCATABLE  20 JUL 76   19:17:06   82   1     1               10530
LVENO           RELOCATABLE  20 JUL 76   19:17:18   83   5    36               10540
SNMTBL          RELOCATABLE  20 JUL 76   19:17:29   84   3    12               10581
DHLP            ABSOLUTE     20 JUL 76   19:18:15   85       725               10596
NEXT AVAILABLE LOCATION-                                                       11321

                       ASSEMBLER PROCEDURE TABLE

D NAME        LOCATION     LINK    D NAME        LOCATION     LINK    D NAME        LOCATION     LINK
  CCT           274460     77      • CCT            98528     17        CLSI          276507     77
• CLSI           98575     17        DSWORK        260601     77      • DSWORK         82829     17
• EQUATE         75880     15        EQUATE         79520     16        ERROR         276392     77
• ERROR          98910     17        FERR          276392     77      • FERR           98910     17
  INCR          276384     77      • INCR           98459     17        JE            276130     77
• JE             98198     17        JEP           276130     77      • JEP            98198     17
  JEZ           276257     77      • JEZ            98325     17        JG            276130     77
• JG             98198     17        JLE           276130     77      • JLE            98198     17
• JNE            98198     17        JNE           276130     77        JNEZ          276257     77
• JNEZ           98325     17        JNV           276257     77      • JNV            98325     17
  JNW           276130     77      • JNW            98198     17      • JOP            98198     17
  JOP           276130     77      • JPV            98325     17        JPV           276257     77
  JW            276130     77      • JW             98198     17      • NAMPRO         77423     15
  NAMPRO         81063     16        OPSI          276507     77      • OPSI           98575     17
  PARRAY        276598     77      • PARRAY         98666     17        RDSI          276507     77
• RDSI           98575     17      • RESREG         77360     15        RESREG         81000     16
  RFSFCT        275892     77      • RFSFCT         97960     17        RFSPOOL       276067     77
• RFSPOOL        98135     17        SCHEMA        277290     78      • SCHEMA         61214     14
• SET            98496     17        SET           274928     77      • SHOVE          75670     15
  SHOVE          79310     16        SNZ            79505     16      • SNZ            75865     15
  SVREG          80938     16      • SVREG          77298     15      • TRACE          77228     15
  TRACE          80868     16      • WRSI           98575     17        WRSI          276507     77

COBOL PROCEDURE TABLE EMPTY

FORTRAN PROCEDURE TABLE EMPTY
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ENTRY POINT TABLE EMPTY

@PRT,TL F9.

LEE*F9(1)   ELEMENT TABLE

D  NAME         VERSION      TYPE          DATE        TIME      SEQ #  SIZE-PRE,TEXT (CYCLE WORD) PSRMODE  LOCATION
   DPOOL        DBCOB17      RELOCATABLE   02 APR 69   09:49:39    1     1      3                             1792
   DBCLOR       DBCOB17      RELOCATABLE   03 JAN 73   16:12:47    2     2      2                             1796
   [illegible]  DBCOB17      RELOCATABLE   03 JAN 73   16:13:06    3     4     12                             1800
   DBCLOF       DBCOB17      RELOCATABLE   03 JAN 73   16:55:19    4     2      3                             1816
   DBOPEN       DBCOB17      RELOCATABLE   03 JAN 73   16:56:15    5     2      8                             1821
   DBOUT        DBCOB17      RELOCATABLE   03 JAN 73   16:57:07    6     3      9                             1831
   DBIN         DBCOB17      RELOCATABLE   05 JAN 73   19:07:16    7     3     15                             1843
   DBINOT       DBCOB17      RELOCATABLE   05 JAN 73   19:09:14    8     3      9                             1861
   ADMLLIST                  ELT SYMB      29 APR 74   02:34:00    9            2      5    0    1            1873
   SKEL         BASE         ELT SYMB      16 MAY 74   06:58:40   10          296      5    0    1            1875
   DMSUP                     ELT SYMB      15 APR 74   19:59:05   11            5      5    0    1            2171
   ADMLPHAP                  ELT SYMB      26 SEP 75   16:28:30   12            5      5    0    1            2176
   ADMLPHAP     BASE         ELT SYMB      26 SEP 75   16:28:35   13            5      5    0    1            2181
   ACOPROC                   ASM PROC      26 SEP 75   16:30:01   14          152      5    0    1            2186
   ACOPROC      BASE         ASM PROC      26 SEP 75   16:30:01   15          152      5    0    1            2330
   SCHEMA       BASE         ASM PROC      26 SEP 75   16:30:48   16          510      5    0    1            2490
   DSWORK       BASE         ASM PROC      26 SEP 75   16:32:31   17          593      5    0    1            3000
   NNLT                      ASM SYMB      26 SEP 75   16:48:47   18          121      5    0    1            3593
   NNLT                      RELOCATABLE   26 SEP 75   16:48:48   19     3     17                             3714
   DRMWRT                    ASM SYMB      26 SEP 75   16:48:54   20           31      5    0    1            3734
   DRMWRT                    RELOCATABLE   26 SEP 75   16:48:56   21     2      6                             3765
   ITREAD                    ASM SYMB      26 SEP 75   16:48:56   22           14      5    0    1            3773
   ITREAD                    RELOCATABLE   26 SEP 75   16:49:00   23     2      2                             3787
   ITWRIT                    ASM SYMB      26 SEP 75   16:49:01   24           15      5    0    1            3791
   ITWRIT                    RELOCATABLE   26 SEP 75   16:49:02   25     2      4                             3806
   INCLUD                    ASM SYMB      26 SEP 75   16:49:07   26          197      5    0    1            3812
   INCLUD                    RELOCATABLE   26 SEP 75   16:49:14   27     3     38                             4009
   NAMETB                    ASM SYMB      26 SEP 75   16:49:20   28            5      5    0    1            4050
   NAMETB                    RELOCATABLE   26 SEP 75   16:49:20   29     2      1                             4055
   NLIT                      ASM SYMB      26 SEP 75   16:49:27   30          275      5    0    1            4058
   SCAN                      ASM SYMB      26 SEP 75   16:49:41   31          430      5    0    1            4333
   PRCDIV                    ASM SYMB      26 SEP 75   16:49:55   32          229      5    0    1            4763
   DMLSGP                    ASM SYMB      26 SEP 75   16:50:07   33            4      5    0    1            4992
   DMLSGP                    RELOCATABLE   26 SEP 75   16:50:09   34     1      1                             4996
   COOR                      ASM SYMB      26 SEP 75   16:50:14   35          137      5    0    1            4998
   COOR                      RELOCATABLE   26 SEP 75   16:50:21   36     7     19                             5135
   DATCOM                    ASM SYMB      26 SEP 75   16:50:28   37           42      5    0    1            5161
   DCMNTS                    ASM SYMB      26 SEP 75   16:50:34   38          107      5    0    1            5203
   DGEND                     ASM SYMB      26 SEP 75   16:50:53   39          529      5    0    1            5310
   IEDDIV                    ASM SYMB      26 SEP 75   16:51:12   40          137      5    0    1            5839
   IEDDIV                    RELOCATABLE   26 SEP 75   16:51:14   41     4     24                             5976
   INVOKE                    ASM SYMB      26 SEP 75   16:51:31   42          467      5    0    1            6004
   LEVEL                     ASM SYMB      26 SEP 75   16:51:45   43            2      5    0    1            6471
   LVEND                     ASM SYMB      26 SEP 75   16:51:57   44          477      5    0    1            6473
   MAIN                      ASM SYMB      26 SEP 75   16:52:17   45          280      5    0    1            6950
   PDMIFS                    ASM SYMB      26 SEP 75   16:52:52   46          725      5    0    1            7230
   PDOCRI                    ASM SYMB      26 SEP 75   16:53:17   47          264      5    0    1            7955
   PDOCRI                    RELOCATABLE   26 SEP 75   16:53:23   48     5     31                             8219
   PGMDDM                    ASM SYMB      26 SEP 75   16:53:29   49          160      5    0    1            8255
   PGMDDM                    RELOCATABLE   26 SEP 75   16:53:30   50     5     19                             8415
   PHASE2                    ASM SYMB      26 SEP 75   16:53:38   51           76      5    0    1            8439
   PHASE2                    RELOCATABLE   26 SEP 75   16:53:38   52     3     12                             8515
   PICSIZ                    ASM SYMB      26 SEP 75   16:53:43   53          127      5    0    1            8530
   PROCOM                    ASM SYMB      26 SEP 75   16:53:55   54           70      5    0    1            8657
   PROCOM                    RELOCATABLE   26 SEP 75   16:53:58   55     4     10                             8727
   REFRMT                    ASM SYMB      26 SEP 75   16:54:02   56          328      5    0    1            8741
   REFRMT                    RELOCATABLE   26 SEP 75   16:54:11   57     2     45                             9069
   RELGEN                    ASM SYMB      26 SEP 75   16:54:23   58          223      5    0    1            9116
   LEX                       ASM SYMB      26 SEP 75   16:54:36   59          447      5    0    1            9339
   SNMTBL                    ASM SYMB      26 SEP 75   16:54:49   60           64      5    0    1            9786
   SNMTBL                    RELOCATABLE   26 SEP 75   16:54:56   61     4     13                             9850
   PRCDIV                    RELOCATABLE   26 SEP 75   18:05:15   62    10     32                             9867
   MAIN                      RELOCATABLE   30 SEP 75   12:49:52   63     9     55                             9909
   DCMNTS                    RELOCATABLE   05 NOV 75   17:01:46   64     1     42                             9973
   RELGEN                    RELOCATABLE   05 NOV 75   17:02:33   65     3     27                            10016
   SGS                       ELT SYMB      18 DEC 75   17:00:42   66          274      5    0    1           10046
   NLIT                      RELOCATABLE   04 FEB 76   01:44:07   67     4     31                            10320
   LEX                       RELOCATABLE   20 FEB 76   17:38:29   48     2     66                            10355
   SCAN                      RELOCATABLE   09 APR 76   16:23:48   69    10     64                            10423
   SKEL                      ELT SYMB      03 MAY 76   22:58:35   70          372      5    0    1           10497
   PDMIFS                    RELOCATABLE   20 MAY 76   11:25:26   71     7    110                            10869
```

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     D$WORK                    ASM PROC     19 JUN 76   21:27:59     72              598   5   0   1              10976
     SCHEMA                    ASM PROC     20 JUL 76   19:03:30     73              510   1   0   1              11574
     DATCOM                    RELOCATABLE  20 JUL 76   19:19:01     74        6       6                          12084
     DGEND                     RELOCATABLE  20 JUL 76   19:19:22     75        4      83                          12096
     INVOKE                    RELOCATABLE  20 JUL 76   19:19:48     76        6      60                          12183
     LVENO                     RELOCATABLE  20 JUL 76   19:20:08     77        5      62                          12249
     PICSIZ                    RELOCATABLE  26 AUG 76   22:22:23     78        1      20                          12316
     LEVEL                     RELOCATABLE  28 SEP 76   04:24:19     79        1       1                          12337
     ADMLP                     ABSOLUTE     28 SEP 76   04:24:46     80              853                          12339
   NEXT AVAILABLE LOCATION-                                                                                      13192

                         ASSEMBLER PROCEDURE TABLE

   D NAME          LOCATION        LINK    D NAME          LOCATION        LINK    D NAME          LOCATION        LINK
     CCT             323248        72      * CCT              99760        17        CL$1            323295        72
   * CL$1             99807        17        D$WORK          307389        72      * D$WORK           84061        17
   * EQUATE           61652        14        EQUATE           65908        15        ERROR           323130        72
   * ERROR            99642        17        FERR            323130        72      * FERR             99642        17
     INCR            323174        72      * INCR             99686        17        JE              322918        72
   * JE               99430        17        JEP             322918        72      * JEP              99430        17
     JEZ             323045        72      * JEZ              99557        17        JG              322918        72
   * JG               99430        17        JLE             322918        72      * JLE              99430        17
   * JNE              99430        17        JNE             322918        72        JNEZ            323045        72
   * JNEZ             99557        17        JNV             323045        72      * JNV              99557        17
     JNW             322918        72      * JNW              99430        17      * JOP              99430        17
     JOP             322918        72      * JPV              99557        17        JPV             323045        72
     JW              322918        72      * JW               99430        17      * NAMPRO           63350        14
     NAMPRO           67606        15        OP$1            323295        72      * OP$1             99807        17
     PARRAY          323386        72      * PARRAY           99898        17        RD$1            323295        72
   * RD$1             99807        17        RESREG           67543        15      * RESREG           63287        14
     RF$FCT          322680        72      * RF$FCT           99192        17        RF$POOL         322855        72
   * RF$POOL          99367        17        SCHEMA          324078        73      * SCHEMA           69726        16
   * SET              99728        17        SET             323216        72        SHOVE            65646        15
   * SHOVE            61390        14      * SNZ              61619        14        SNZ              65875        15
     SVREG            67481        15      * SVREG            63225        14        TRACE            67411        15
   * TRACE            63155        14      * WR$1             99807        17        WR$1            323295        72

   COBOL PROCEDURE TABLE EMPTY

   FORTRAN PROCEDURE TABLE EMPTY

   ENTRY POINT TABLE EMPTY

   @PRT,TL F10.

   LEE*F10(1)  ELEMENT TABLE

   D  NAME           VERSION      TYPE              DATE       TIME       SEQ #  SIZE-PRE,TEXT (CYCLE WORD) PSRMODE  LOCATION
      COPYFDMLP                   ELT SYMB          27 JUN 75  13:58:1[illegible]  1          1     5    1    2           1792
      VALIDATE                    ELT SYMB  -Q      17 JUL 75  12:28:59     2         19    63    3    4           1793
      PRT                         ELT SYMB          22 AUG 75  11:24:29     3          3     5    1    2           1812
      LNK                         ELT SYMB          21 JUL 75  09:43:43     4        100     5    0    1           1815
      COPYFSSP                    ELT SYMB          26 AUG 75  09:37:12     5          1     5    1    2           1915
      BDI$EN         BASE         ELT SYMB          29 AUG 75  13:54:20     6          6     5    0    1           1916
      ENVELOPE                    ASM SYMB          03 SEP 75  11:14:09     7        124     5    0    1           1922
      INTEST                      ELT SYMB          05 SEP 75  14:33:27     8          7     5    2    3           2046
      LR-DML                      RELOCATABLE       22 SEP 75  16:40:29     9    5    27                           2053
      FSKEL          BASE         ELT SYMB          26 SEP 75  00:34:24    10         93     5    1    2           2085
      FSGS           BASE         ELT SYMB          26 SEP 75  00:34:27    11         28     5    1    2           2178
      USERFSGS       BASE         ELT SYMB          26 SEP 75  00:34:31    12          1     5    1    2           2206
      PDP-TRAN       BASE         ELT SYMB          26 SEP 75  00:34:33    13         44     5    0    1           2207
      FSSPEQUFS      BASE         ELT SYMB          26 SEP 75  00:34:36    14         17     5    1    2           2251
      FDMLPEQUFS     BASE         ELT SYMB          26 SEP 75  00:34:37    15          5     5    0    1           2268
      FSSP           BASE         ELT SYMB          26 SEP 75  00:34:[illegible]    16         53     [illegible]    [illegible]    [illegible]           2273
      PARAMSFSSP     BASE         ELT SYMB  -Q      26 SEP 75  00:34:44    17         64     5    0    1           2326
      DMCATABS       BASE         ELT SYMB          26 SEP 75  00:34:45    18         67     5    0    1           2390
      DICTFSSP       BASE         ELT SYMB  -Q      26 SEP 75  00:34:48    19        102    63    1    2           2457
      ASCII          BASE         ELT SYMB          26 SEP 75  00:34:50    20          2     5    0    1           2559
      FIELDATA       BASE         ELT SYMB          26 SEP 75  00:34:50    21          3     5    0    1           2561
      SS1-ERRPROC    BASE         ELT SYMB          26 SEP 75  00:34:51    22         58     5    0    1           2564
      CHECKPOINT     BASE         ELT SYMB          26 SEP 75  00:34:53    23          4     5    1    2           2622
      OCTAL          BASE         ELT SYMB          26 SEP 75  00:34:54    24          3     5    0    1           2626
      SS1-VALIDATE   BASE         ELT SYMB  -Q      26 SEP 75  00:34:55    25         16    63    0    1           2629
      AS1            BASE         ELT SYMB          26 SEP 75  00:34:58    26         55     5    1    2           2645
      SS1-ERROR      BASE         ELT SYMB  -Q      26 SEP 75  00:35:01    27         28    63    0    1           2700
      SS1-RECORD1    BASE         ELT SYMB  -Q      26 SEP 75  00:35:02    28         23    63    0    1           2728
      SS1-RECORD2    BASE         ELT SYMB  -Q      26 SEP 75  00:35:03    29          2    63    0    1           2751
      SS1-AREA       BASE         ELT SYMB  -Q      26 SEP 75  00:36:04    30         14    63    0    1           2753
```

```
SSI-SET       BASE     ELT SYMB -Q  26 SEP 75  00:35:05   31    14  63  0  1     2767
SSI-COMMON    BASE     ELT SYMB -Q  26 SEP 75  00:35:06   32     8  63  0  1     2781
SSI-EQUIV1    BASE     ELT SYMB     26 SEP 75  00:35:07   33     6   5  0  1     2789
SSI-EQUIV2    BASE     ELT SYMB -Q  26 SEP 75  00:35:08   34    11  63  0  1     2795
SSI-SCHEM1    BASE     ELT SYMB -Q  26 SEP [illegible]  [illegible]   35  [illegible]  63  0  1  [illegible]
SSI-ALIAS1    BASE     ELT SYMB -Q  26 SEP 75  00:35:09   36    33  63  0  1     2823
SSI-ALIAS2    BASE     ELT SYMB -Q  26 SEP 75  00:35:10   37     5  63  0  1     2856
SSI-FNG       BASE     ELT SYMB -Q  26 SEP 75  00:35:17   38   111   5  1  2     2861
SSO           BASE     ELT SYMB     26 SEP 75  00:35:20   39    31   5  1  2     2972
READ-IOW      BASE     ELT SYMB     [illegible]  [illegible]  [illegible]  [illegible]   5  0  1  [illegible]
ASIAR         BASE     ELT SYMB     26 SEP 75  00:35:23   41    24   5  0  1     3007
ASIST         BASE     ELT SYMB     26 SEP 75  00:35:26   42    74   5  1  2     3031
ASIRC         BASE     ELT SYMB     26 SEP 75  00:35:39   43   158   5  1  2     3105
SSODATA       BASE     ELT SYMB     26 SEP 75  00:35:43   44    64   5  0  1     3263
FTNFOR        BASE     ELT SYMB -Q  26 SEP 75  00:35:48   45   100   5  1  2     3327
SSOFTN        BASE     ELT SYMB     26 SEP 75  00:35:54   46    42   5  1  2     3427
SSOMAP        BASE     ELT SYMB     26 SEP 75  00:35:58   47    51   5  0  1     3519
SSOCLG        BASE     ELT SYMB -Q  26 SEP 75  00:36:04   48    83   5  1  2     3570
SSOREC        BASE     ELT SYMB     26 SEP 75  00:36:10   49    83   5  1  2     3653
SSODCA        BASE     ELT SYMB     26 SEP 75  00:36:12   50    18   5  0  1     3736
SSORPG        BASE     ELT SYMB     26 SEP 75  00:36:14   51    48   5  1  2     3754
SSODSW        BASE     ELT SYMB     26 SEP 75  00:36:20   52   157   5  1  2     3802
FDMLP         BASE     ELT SYMB -Q  26 SEP 75  00:36:28   53   404   5  1  2     3959
STMSTM        BASE     ELT SYMB     26 SEP 75  00:36:30   54     2   5  0  1     4363
FDMLPPARAMS   BASE     ELT SYMB -Q  26 SEP 75  00:36:31   55    29  63  0  1     4365
FDMLPDICT     BASE     ELT SYMB -Q  26 SEP 75  00:36:32   56    74  63  0  1     4394
FDMLPERRP     BASE     ELT SYMB -Q  26 SEP 75  00:36:32   57    10   5  0  1     4468
TRIM-CONT     BASE     ELT SYMB     26 SEP 75  00:36:33   58     3   5  0  1     4478
STMPROC1      BASE     ELT SYMB     26 SEP 75  00:36:34   59     5   5  0  1     4481
FDICOMMENT    BASE     ELT SYMB     26 SEP 75  00:36:35   60     5   5  0  1     4486
FDIFRAGMENT   BASE     ELT SYMB     26 SEP 75  00:36:35   61     5   5  0  1     4491
FDISTRAIGHT   BASE     ELT SYMB     26 SEP 75  00:36:36   62     4   5  0  1     4496
FDIMISSING    BASE     ELT SYMB     26 SEP 75  00:36:37   63     3   5  0  1     4500
DCL-INSERT    BASE     ELT SYMB     26 SEP 75  00:36:40   64     5  63  0  1     4503
DCL-DMCA      BASE     ELT SYMB     26 SEP 75  00:36:40   65     4   5  0  1     4508
FDMLPFD       BASE     ELT SYMB     26 SEP 75  00:36:41   66     3   5  0  1     4512
GEN-DATA      BASE     ELT SYMB     26 SEP 75  00:36:43   67    17   5  1  2     4515
STMPROC2      BASE     ELT SYMB -Q  26 SEP 75  00:36:46   68    63   5  1  2     4532
STMPROC3      BASE     ELT SYMB     26 SEP 75  00:36:48   69    31   5  0  1     4595
STMPROC4      BASE     ELT SYMB     26 SEP 75  00:36:48   70    48   5  0  1     4626
STMPROC5      BASE     ELT SYMB     26 SEP 75  00:36:49   71    11   5  0  1     4679
STMINITIAL    BASE     ELT SYMB     26 SEP 75  00:36:50   72     2   5  0  1     4685
STMACPRUN     BASE     ELT SYMB     26 SEP 75  00:36:51   73     1   5  0  1     4687
STMACTION     BASE     ELT SYMB     26 SEP 75  00:36:52   74     4   5  0  1     4688
STMEND        BASE     ELT SYMB     26 SEP 75  00:36:52   75     1   5  0  1     4692
STMERROR      BASE     ELT SYMB -Q  26 SEP 75  00:36:53   76     1   5  0  1     4693
STMREALM      BASE     ELT SYMB     26 SEP 75  00:36:54   77     3   5  0  1     4694
STMRECORD     BASE     ELT SYMB     26 SEP 75  00:36:54   78     3   5  0  1     4697
STMSET        BASE     ELT SYMB     26 SEP 75  00:36:55   79     3   5  0  1     4700
STMSPECSET    BASE     ELT SYMB     26 SEP 75  00:36:56   80     2   5  0  1     4703
STMKEY        BASE     ELT SYMB     26 SEP 75  00:36:57   81     1   5  0  1     4705
STMREALMKEY   BASE     ELT SYMB     26 SEP 75  00:36:59   82     1   5  0  1     4706
STMGENREALM   BASE     ELT SYMB     26 SEP 75  00:37:00   83     3   5  0  1     4707
STMITEM       BASE     ELT SYMB     26 SEP 75  00:37:00   84     3   5  0  1     4710
SUBSCHEMADCL  BASE     ELT SYMB -Q  26 SEP 75  00:37:01   85    12  63  0  1     4713
SCHEMADCL     BASE     ELT SYMB     26 SEP 75  00:37:02   86     1   5  0  1     4725
RUNID         BASE     ELT SYMB     26 SEP 75  00:37:02   87     1   5  0  1     4726
PRIORITY      BASE     ELT SYMB     26 SEP 75  00:37:03   88     1   5  0  1     4727
POINTERS      BASE     ELT SYMB     26 SEP 75  00:37:04   89     1   5  0  1     4728
STATISTICS    BASE     ELT SYMB     26 SEP 75  00:37:05   90     1   5  0  1     4729
RECOVERY      BASE     ELT SYMB     26 SEP 75  00:37:05   91     1   5  0  1     4730
DCLERROR      BASE     ELT SYMB     26 SEP 75  00:37:06   92     2   5  0  1     4731
GENERALIZED   BASE     ELT SYMB -Q  26 SEP 75  00:37:07   93    27  63  0  1     4733
EXTERNAL      BASE     ELT SYMB -Q  26 SEP 75  00:37:07   94     4  63  0  1     4760
DCLACQUIRE    BASE     ELT SYMB     26 SEP 75  00:37:08   95     3   5  0  1     4764
STMIMPART     BASE     ELT SYMB     26 SEP 75  00:37:09   96     3   5  0  1     4767
STMIMPROLL    BASE     ELT SYMB     26 SEP 75  00:37:10   97     1   5  0  1     4770
STMDEPROLL    BASE     ELT SYMB     26 SEP 75  00:37:11   98     1   5  0  1     4771
STMDEPART     BASE     ELT SYMB     26 SEP 75  00:37:12   99     1   5  0  1     4772
STMFREEALL    BASE     ELT SYMB     26 SEP 75  00:37:13  100     1   5  0  1     4773
STMFREE       BASE     ELT SYMB     26 SEP 75  00:37:14  101     1   5  0  1     4774
STMFINRLMS    BASE     ELT SYMB     26 SEP 75  00:37:15  102     5   5  0  1     4776
STMFINRLM     BASE     ELT SYMB     26 SEP 75  00:37:15  103     1   5  0  1     4780
STMFINISH     BASE     ELT SYMB     26 SEP 75  00:37:16  104     1   5  0  1     4781
STMRDYUSE     BASE     ELT SYMB     26 SEP 75  00:37:17  105     1   5  0  1     4782
STMRDYACS     BASE     ELT SYMB     26 SEP 75  00:37:19  106     1   5  0  1     4783
STMRDYMODE    BASE     ELT SYMB     26 SEP 75  00:37:23  107     5   5  0  1     4784
STMREADY      BASE     ELT SYMB     26 SEP 75  00:37:25  108     2   5  0  1     4789
STMOPTREC     BASE     ELT SYMB     26 SEP 75  00:37:27  109     2   5  0  1     4791
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STMGET        BASE     ELT  SYMB      26  SEP  75   00:37:28    110      1    5   0   1        4793
STMKEEP       BASE     ELT  SYMB      26  SEP  75   00:37:31    111      1    5   0   1        4794
STMERASETYP   BASE     ELT  SYMB      26  SEP  75   00:37:34    112      1    5   0   1        4795
STMERASE      BASE     ELT  SYMB      26  SEP  75   00:37:35    113      1    5   0   1        4796
STMINCLUD     BASE     ELT  SYMB      26  SEP  75   00:37:37    114      4    5   0   1        4797
STMMODREC     BASE     ELT  SYMB      26  SEP  75   00:37:39    115      3    5   0   1        4801
STMMODIFY     BASE     ELT  SYMB      26  SEP  75   00:37:41    116      1    5   0   1        4804
STMRETSETS    BASE     ELT  SYMB      26  SEP  75   00:37:43    117      5    5   0   1        4805
STMRECCHO     BASE     ELT  SYMB      26  SEP  75   00:37:44    118      1    5   0   1        4810
STMRLMCHO     BASE     ELT  SYMB      26  SEP  75   00:37:46    119      1    5   0   1        4811
STMSETCHO     BASE     ELT  SYMB      26  SEP  75   00:37:48    120      1    5   0   1        4812
STMRETAIN     BASE     ELT  SYMB      26  SEP  75   00:37:50    121      1    5   0   1        4813
STMSTOREREC   BASE     ELT  SYMB      26  SEP  75   00:37:53    122      2    5   0   1        4814
STMSTORE      BASE     ELT  SYMB      26  SEP  75   00:37:54    123      1    5   0   1        4816
STMCONNSET    BASE     ELT  SYMB      26  SEP  75   00:38:00    124      8    5   0   1        4817
STMCONNREC    BASE     ELT  SYMB      26  SEP  75   00:38:01    125      3    5   0   1        4825
STMCONNDIS    BASE     ELT  SYMB      26  SEP  75   00:38:01    126      1    5   0   1        4828
STMLOGRCVRY   BASE     ELT  SYMB      26  SEP  75   00:38:02    127      1    5   0   1        4829
STMLOG        BASE     ELT  SYMB      26  SEP  75   00:38:03    128      1    5   0   1        4830
STMLOGBODY    BASE     ELT  SYMB      26  SEP  75   00:38:04    129      1    5   0   1        4831
STMACPRLM     BASE     ELT  SYMB      26  SEP  75   00:38:04    130      2    5   0   1        4832
STMACPREC     BASE     ELT  SYMB      26  SEP  75   00:38:05    131      2    5   0   1        4834
STMACPSET     BASE     ELT  SYMB      26  SEP  75   00:38:06    132      2    5   0   1        4836
STMACPKEY     BASE     ELT  SYMB      26  SEP  75   00:38:06    133      1    5   0   1        4838
STMACPCUR     BASE     ELT  SYMB      26  SEP  75   00:38:07    134      1    5   0   1        4839
STMACPRLMK    BASE     ELT  SYMB      26  SEP  75   00:38:08    135      1    5   0   1        4840
STMACPRLMN    BASE     ELT  SYMB      26  SEP  75   00:38:08    136      1    5   0   1        4841
STMACCEPT     BASE     ELT  SYMB      26  SEP  75   00:38:09    137      1    5   0   1        4842
STMASSIGN     BASE     ELT  SYMB      26  SEP  75   00:38:10    138     10    5   0   1        4843
STMRSE1KEY    BASE     ELT  SYMB      26  SEP  75   00:38:11    139      4    5   0   1        4853
STMRSE1REC    BASE     ELT  SYMB      26  SEP  75   00:38:12    140      2    5   0   1        4857
STMRSE1       BASE     ELT  SYMB      26  SEP  75   00:38:12    141      1    5   0   1        4859
STMRSE2RECT   BASE     ELT  SYMB      26  SEP  75   00:38:13    142      1    5   0   1        4860
STMRSE2REC    BASE     ELT  SYMB      26  SEP  75   00:38:14    143      1    5   0   1        4861
STMRSE2       BASE     ELT  SYMB      26  SEP  75   00:38:14    144      1    5   0   1        4862
STMRSE3SET    BASE     ELT  SYMB      26  SEP  75   00:38:15    145      1    5   0   1        4863
STMUSING      BASE     ELT  SYMB      26  SEP  75   00:38:16    146      4    5   0   1        4864
STMRSE3US     BASE     ELT  SYMB      26  SEP  75   00:38:17    147      1    5   0   1        4868
STMRSE3REC    BASE     ELT  SYMB      26  SEP  75   00:38:22    148      1    5   1   2        4869
STMRSE3       BASE     ELT  SYMB      26  SEP  75   00:38:25    149      1    5   1   2        4870
STMRSE4SEQU   BASE     ELT  SYMB      26  SEP  75   00:38:27    150      3    5   0   1        4871
STMRSE43SET   BASE     ELT  SYMB      26  SEP  75   00:38:28    151      2    5   0   1        4874
STMRSE44SET   BASE     ELT  SYMB      26  SEP  75   00:38:30    152      2    5   0   1        4876
STMRSE43RLM   BASE     ELT  SYMB      26  SEP  75   00:38:31    153      2    5   0   1        4878
STMRSE44RLM   BASE     ELT  SYMB      26  SEP  75   00:38:33    154      2    5   0   1        4880
STMRSE44REC   BASE     ELT  SYMB      26  SEP  75   00:38:35    155      2    5   0   1        4882
STMRSE45REC   BASE     ELT  SYMB      26  SEP  75   00:38:37    156      2    5   0   1        4884
STMRSE4       BASE     ELT  SYMB      26  SEP  75   00:38:40    157      3    5   0   1        4886
STMRSE5REC    BASE     ELT  SYMB      26  SEP  75   00:38:42    158      3    5   0   1        4889
STMRSE5OPREC  BASE     ELT  SYMB      26  SEP  75   00:38:44    159      2    5   0   1        4892
STMRSE5SET    BASE     ELT  SYMB      26  SEP  75   00:38:45    160      2    5   0   1        4894
STMRSE5RLM    BASE     ELT  SYMB      26  SEP  75   00:38:45    161      2    5   0   1        4896
STMRSE5       BASE     ELT  SYMB      26  SEP  75   00:38:46    162      1    5   0   1        4898
STMRSE6       BASE     ELT  SYMB      26  SEP  75   00:38:47    163      2    5   0   1        4899
STMRSE7REC    BASE     ELT  SYMB      26  SEP  75   00:38:47    164      2    5   0   1        4901
STMRSE7SET    BASE     ELT  SYMB      26  SEP  75   00:38:48    165      2    5   0   1        4903
STMRSE7       BASE     ELT  SYMB      26  SEP  75   00:38:49    166      2    5   0   1        4905
STMFINDFET    BASE     ELT  SYMB      26  SEP  75   00:38:50    167      1    5   0   1        4907
STMACQINT     BASE     ELT  SYMB      26  SEP  75   00:38:50    168      4    5   0   1        4908
STMACQST      BASE     ELT  SYMB      26  SEP  75   00:38:51    169      1    5   0   1        4912
STMACQSET     BASE     ELT  SYMB      26  SEP  76   00:38:52    170      1    5   0   1        4913
STMACQDEF     BASE     ELT  SYMB      26  SEP  75   00:38:53    171      1    5   0   1        4914
STMACQBODY    BASE     ELT  SYMB      26  SEP  75   00:38:54    172      1    5   0   1        4915
STMTENANCY    BASE     ELT  SYMB  -Q  26  SEP  75   00:38:54    173      4    5   0   1        4916
STMMEMBER     BASE     ELT  SYMB  -Q  26  SEP  75   00:38:55    174      2    5   0   1        4920
[illegible]   BASE     ELT  SYMB  -Q  26  SEP  75   00:38:56    175      3    5   0   1        4922
FDIINCLUDE    BASE     ELT  SYMB      26  SEP  75   00:38:57    176      3    5   0   1        4925
INVOKE        BASE     ELT  SYMB  -Q  26  SEP  75   00:38:58    177     33   63   0   1        4928
AREACODES     BASE     ELT  SYMB      26  SEP  75   00:38:59    178      4    5   0   1        4961
SETCODES      BASE     ELT  SYMB  -Q  26  SEP  75   00:38:59    179      9    5   0   1        4965
GENCODES      BASE     ELT  SYMB      26  SEP  75   00:39:00    180      7    5   0   1        4974
RECORDCODES   BASE     ELT  SYMB      26  SEP  76   00:39:01    181      8    5   0   1        4981
CODESDCL      BASE     ELT  SYMB      26  SEP  75   00:39:03    182      2    5   0   1        4989
ER-DML        BASE     ELT  SYMB      26  SEP  75   00:39:15    183    188    5   1   2        4991
LNK           BASE     ELT  SYMB      26  SEP  75   00:39:18    184    100    5   0   1        5179
ENVELOPE      BASE     ELT  SYMB      26  SEP  75   00:39:30    185    195    5   1   2        5279
MAPFSSP       BASE     ELT  SYMB      26  SEP  75   00:39:47    186     11    5   1   2        5474
COMFSSP       BASE     ELT  SYMB      26  SEP  75   00:39:51    187      4    5   1   2        5485
MAPFDMLP      BASE     ELT  SYMB      26  SEP  75   00:39:59    188     11    5   1   2        5489
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CONFDMLP      BASE      ELT SYMB     26 SEP 75  00:40:10   189       4   5  1  2      5500
FTNUP                   ELT SYMB     20 FEB 76  17:33:46   190       7   5  5  5      5504
FSKEL                   ELT SYMB     28 SEP 76  04:27:22   191      88   5  0  1      5511
FSGS                    ELT SYMB     28 SEP 76  04:27:25   192      28   5  0  1      5599
USERFSGS                ELT SYMB     28 SEP 76  04:27:27   193       1   5  0  1      5627
PDP-TRAN                ELT SYMB     28 SEP 76  04:27:30   194      44   5  0  1      5628
PDP-TRAN                OMNIBUS      28 SEP 76  04:27:36   195      90                5672
FSSPEQUFS               ELT SYMB     28 SEP 76  04:27:39   196      18   5  0  1      5762
FDMLPEQUFS              ELT SYMB     28 SEP 76  04:27:43   197       5   5  0  1      5780
FDMLPDI[illegible]      ELT SYMB -Q  28 SEP 76  04:35:39   198     920   5  0  1      5785
FDMLPPACKET             ELT SYMB -Q  28 SEP 76  04:39:53   199     603   5  0  1      6705
FSSPPACKET              ELT SYMB -Q  28 SEP 76  04:44:01   200     604   5  0  1      7308
FSSPDSWORK              ELT SYMB -Q  28 SEP 76  04:49:42   201     918   5  0  1      7912
FSSPSCHEMA              ELT SYMB -Q  28 SEP 76  04:53:31   202     778   5  0  1      8830
FSSP                    ELT SYMB     28 SEP 76  04:53:35   203      53   5  0  1      9608
PARAMSFSSP              ELT SYMB -Q  28 SEP 76  04:53:40   204      68   5  0  1      9661
DMCATABS                ELT SYMB     28 SEP 76  04:53:45   205      80   5  0  1      9729
DICTFSSP                ELT SYMB -Q  28 SEP 76  04:53:52   206     105   5  0  1      9809
ASCII                   ELT SYMB     28 SEP 76  04:53:54   207       2   5  0  1      9914
FIELDATA                ELT SYMB     28 SEP 76  04:53:56   208       3   5  0  1      9916
SSI-ERRPROC             ELT SYMB     28 SEP 76  04:53:59   209      58   5  0  1      9919
CHECKPOINT              ELT SYMB     28 SEP 76  04:54:01   210       4   5  0  1      9977
OCTAL                   ELT SYMB     28 SEP 76  04:54:03   211       3   5  0  1      9981
SSI-VALIDATE            ELT SYMB -Q  28 SEP 76  04:54:05   212      16  63  0  1      9984
ASI                     ELT SYMB     28 SEP 76  04:54:08   213      54   5  0  1     10000
SSI-ERROR               ELT SYMB -Q  28 SEP 76  04:54:11   214      28  63  0  1     10054
SSI-RECORD1             ELT SYMB -Q  28 SEP 76  04:54:12   215      23  63  0  1     10082
SSI-RECORD2             ELT SYMB -Q  28 SEP 76  04:54:14   216       2  63  0  1     10105
SSI-AREA                ELT SYMB -Q  28 SEP 76  04:54:15   217      14  63  0  1     10107
SSI-SET                 ELT SYMB -Q  28 SEP 76  04:54:16   218      14  63  0  1     10121
SSI-COMMON              ELT SYMB -Q  28 SEP 76  04:54:18   219       8  63  0  1     10135
SSI-EQUIV1              ELT SYMB     28 SEP 76  04:54:19   220       6   5  0  1     10143
SSI-EQUIV2              ELT SYMB -Q  28 SEP 76  04:54:21   221      11  63  0  1     10149
SSI-SCHEMA              ELT SYMB -Q  28 SEP 76  04:54:22   222      17  63  0  1     10160
SSI-ALIAS1              ELT SYMB -Q  28 SEP 76  04:54:24   223      33  63  0  1     10177
SSI-ALIAS2              ELT SYMB -Q  28 SEP 76  04:54:25   224       5  63  0  1     10210
SSI-FNG                 ELT SYMB -Q  28 SEP 76  04:54:27   225     111   5  0  1     10215
SSO                     ELT SYMB     28 SEP 76  04:54:29   226      30   5  0  1     10326
READ-IOW                ELT SYMB     28 SEP 76  04:54:31   227       4   5  0  1     10356
ASIAR                   ELT SYMB     28 SEP 76  04:54:33   228      24   5  0  1     10360
ASIST                   ELT SYMB     28 SEP 76  04:54:35   229      67   5  0  1     10384
ASIRC                   ELT SYMB     28 SEP 76  04:54:44   230     161   5  0  1     10451
SSODATA                 ELT SYMB     28 SEP 76  04:54:53   231      85   5  0  1     10612
FTNFOR                  ELT SYMB -Q  28 SEP 76  04:54:56   232     100   5  0  1     10697
SSOFTN                  ELT SYMB     28 SEP 76  04:55:02   233      93   5  0  1     10797
SSOMAP                  ELT SYMB     28 SEP 76  04:55:05   234      51   5  0  1     10890
SSOCLG                  ELT SYMB -Q  28 SEP 76  04:55:06   235      82   5  0  1     10941
SSOREC                  ELT SYMB     28 SEP 76  04:55:12   236      75   5  0  1     11023
SSODCA                  ELT SYMB     28 SEP 76  04:55:15   237      18   5  0  1     11098
SSORPG                  ELT SYMB     28 SEP 76  04:55:17   238      46   5  0  1     11116
SSODSW                  ELT SYMB     28 SEP 76  04:55:27   239     153   5  0  1     11162
FDMLP                   ELT SYMB -Q  28 SEP 76  04:55:53   240     437   5  0  1     11315
STMSTM                  ELT SYMB     28 SEP 76  04:56:08   241       2   5  0  1     11752
FDMLPPARAMS             ELT SYMB -Q  28 SEP 76  04:56:12   242      30   5  0  1     11754
FDMLPDICT               ELT SYMB -Q  28 SEP 76  04:56:19   243      75   5  0  1     11784
FDMLPERRP               ELT SYMB -Q  28 SEP 76  04:56:22   244       6   5  0  1     11859
TRIM-CONT               ELT SYMB     28 SEP 76  04:56:24   245       3   5  0  1     11865
STMPROC1                ELT SYMB     28 SEP 76  04:56:26   246       5   5  0  1     11868
FDICOMMENT              ELT SYMB     28 SEP 76  04:56:28   247       5   5  0  1     11873
FDIFRAGMENT             ELT SYMB     28 SEP 76  04:56:30   248       5   5  0  1     11878
FDISTRAIGHT             ELT SYMB     28 SEP 76  04:56:31   249       4   5  0  1     11883
FDIMISSING              ELT SYMB     28 SEP 76  04:56:33   250       3   5  0  1     11887
DCL-INSERT              ELT SYMB     28 SEP 76  04:56:35   251       5  63  0  1     11890
DCL-DMCA                ELT SYMB     28 SEP 76  04:56:36   252       4   5  0  1     11895
FDMLPFD                 ELT SYMB     28 SEP 76  04:56:38   253       3   5  0  1     11899
GEN-DATA                ELT SYMB     28 SEP 76  04:56:40   254      17   5  0  1     11902
STMPROC2                ELT SYMB -Q  28 SEP 76  04:56:44   255      69   5  0  1     11919
STMPROC3                ELT SYMB     28 SEP 76  04:56:52   256      31   5  0  1     11988
STMPROC4                ELT SYMB     28 SEP 76  04:56:53   257      48   5  0  1     12019
STMPROC5                ELT SYMB     28 SEP 76  04:56:55   258      11   5  0  1     12067
STMINITIAL              ELT SYMB     28 SEP 76  04:56:57   259       2   5  0  1     12078
STMACPRUN               ELT SYMB     28 SEP 76  04:56:59   260       1   5  0  1     12080
STMACTION               ELT SYMB     28 SEP 76  04:57:00   261       4   5  0  1     12081
STMEND                  ELT SYMB     28 SEP 76  04:57:02   262       1   5  0  1     12085
STMERROR                ELT SYMB -Q  28 SEP 76  04:57:03   263       1   5  0  1     12086
STMREALM                ELT SYMB     28 SEP 76  04:57:05   264       3   5  0  1     12087
STMRECORD               ELT SYMB     28 SEP 76  04:57:07   265       3   5  0  1     12090
STMSET                  ELT SYMB     28 SEP 76  04:57:08   266       3   5  0  1     12093
STMSPECSET              ELT SYMB     28 SEP 76  04:57:10   267       2   5  0  1     12096
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STMKEY                 ELT SYMB      28 SEP 76   04:57:12    268     1   5   0   1    12098
STMREALMKEY            ELT SYMB      28 SEP 76   04:57:13    269     1   5   0   1    12099
STMGENREALM            ELT SYMB      28 SEP 76   04:57:15    270     3   5   0   1    12100
STMITEM                ELT SYMB      28 SEP 76   04:57:16    271     3   5   0   1    12103
SUBSCHEMADCL           ELT SYMB  -Q  28 SEP 76   04:57:19    272    18   5   0   1    12106
SCHEMADCL              ELT SYMB      28 SEP 76   04:57:21    273     1   5   0   1    12124
RUNID                  ELT SYMB      28 SEP 76   04:57:23    274     1   5   0   1    12125
PRIORITY               ELT SYMB      28 SEP 76   04:57:24    275     1   5   0   1    12126
POINTERS               ELT SYMB      28 SEP 76   04:57:26    276     1   5   0   1    12127
STATISTICS             ELT SYMB      28 SEP 76   04:57:28    277     1   5   0   1    12128
RECOVERY               ELT SYMB      28 SEP 76   04:57:30    278     1   5   0   1    12129
DCLERROR               ELT SYMB      28 SEP 76   04:57:31    279     2   5   0   1    12130
GENERALIZED            ELT SYMB  -Q  28 SEP 76   04:57:35    280    29   5   0   1    12132
EXTERNAL               ELT SYMB  -Q  28 SEP 76   04:57:37    281     4  63   0   1    12161
DCLACQUIRE             ELT SYMB      28 SEP 76   04:57:39    282     3   5   0   1    12165
STMIMPART              ELT SYMB      28 SEP 76   04:57:40    283     3   5   0   1    12168
STMIMPROLL             ELT SYMB      28 SEP 76   04:57:42    284     1   5   0   1    12171
STMDEPROLL             ELT SYMB      28 SEP 76   04:57:44    285     1   5   0   1    12172
STMDEPART              ELT SYMB      28 SEP 76   04:57:45    286     1   5   0   1    12173
STMFREEALL             ELT SYMB      28 SEP 76   04:57:47    287     1   5   0   1    12174
STMFREE                ELT SYMB      28 SEP 76   04:57:48    288     1   5   0   1    12175
STMFINRLMS             ELT SYMB      28 SEP 76   04:57:50    289     5   5   0   1    12176
STMFINRLM              ELT SYMB      28 SEP 76   04:57:52    290     1   5   0   1    12181
STMFINISH              ELT SYMB      28 SEP 76   04:57:53    291     1   5   0   1    12182
STMRDYUSE              ELT SYMB      28 SEP 76   04:57:55    292     1   5   0   1    12183
STMRDYACS              ELT SYMB      28 SEP 76   04:57:57    293     1   5   0   1    12184
STMRDYMODE             ELT SYMB      28 SEP 76   04:57:58    294     5   5   0   1    12185
STMREADY               ELT SYMB      28 SEP 76   04:58:00    295     2   5   0   1    12190
STMOPTREC              ELT SYMB      28 SEP 76   04:58:02    296     2   5   0   1    12192
STMGET                 ELT SYMB      28 SEP 76   04:58:03    297     1   5   0   1    12194
STMKEEP                ELT SYMB      28 SEP 76   04:58:05    298     1   5   0   1    12195
STMERASETYP            ELT SYMB      28 SEP 76   04:58:06    299     1   5   0   1    12196
STMERASE               ELT SYMB      28 SEP 76   04:58:08    300     1   5   0   1    12197
STMINCLUD              ELT SYMB      28 SEP 76   04:58:10    301     4   5   0   1    12198
STMMODREC              ELT SYMB      28 SEP 76   04:58:12    302     3   5   0   1    12202
STMMODIFY              ELT SYMB      28 SEP 76   04:58:13    303     1   5   0   1    12205
STMRETSETS             ELT SYMB      28 SEP 76   04:58:15    304     5   5   0   1    12206
STMRECCHO              ELT SYMB      28 SEP 76   04:58:16    305     1   5   0   1    12211
STMRLMCHO              ELT SYMB      28 SEP 76   04:58:18    306     1   5   0   1    12212
STMSETCHO              ELT SYMB      28 SEP 76   04:58:19    307     1   5   0   1    12213
STMRETAIN              ELT SYMB      28 SEP 76   04:58:21    308     1   5   0   1    12214
STMSTOREREC            ELT SYMB      28 SEP 76   04:58:23    309     2   5   0   1    12215
STMSTORE               ELT SYMB      28 SEP 76   04:58:24    310     1   5   0   1    12217
STMCONNSET             ELT SYMB      28 SEP 76   04:58:26    311     8   5   0   1    12218
STMCONNREC             ELT SYMB      28 SEP 76   04:58:27    312     3   5   0   1    12226
STMCONNDIS             ELT SYMB      28 SEP 76   04:58:29    313     1   5   0   1    12229
STMLOGRCVRY            ELT SYMB      28 SEP 76   04:58:31    314     1   5   0   1    12230
STMLOG                 ELT SYMB      28 SEP 76   04:58:33    315     1   5   0   1    12231
STMLOGBODY             ELT SYMB      28 SEP 76   04:58:34    316     1   5   0   1    12232
STMACPRLM              ELT SYMB      28 SEP 76   04:58:36    317     2   5   0   1    12233
STMACPREC              ELT SYMB      28 SEP 76   04:58:38    318     2   5   0   1    12235
STMACPSET              ELT SYMB      28 SEP 76   04:58:40    319     2   5   0   1    12237
STMACPKEY              ELT SYMB      28 SEP 76   04:58:41    320     1   5   0   1    12239
STMACPCUR              ELT SYMB      28 SEP 76   04:58:43    321     1   5   0   1    12240
STMACPRLMK             ELT SYMB      28 SEP 76   04:58:45    322     1   5   0   1    12241
STMACPRLMN             ELT SYMB      28 SEP 76   04:58:47    323     1   5   0   1    12242
STMACCEPT              ELT SYMB      28 SEP 76   04:58:48    324     1   5   0   1    12243
STMASSIGN              ELT SYMB      28 SEP 76   04:58:50    325    10   5   0   1    12244
STMRSE1KEY             ELT SYMB      28 SEP 76   04:58:52    326     4   5   0   1    12254
STMRSE1REC             ELT SYMB      28 SEP 76   04:58:54    327     2   5   0   1    12258
STMRSE1                ELT SYMB      28 SEP 76   04:58:56    328     1   5   0   1    12260
STMRSE2RECT            ELT SYMB      28 SEP 76   04:58:57    329     1   5   0   1    12261
STMRSE2REC             ELT SYMB      28 SEP 76   04:58:59    330     2   5   0   1    12262
STMRSE2                ELT SYMB      28 SEP 76   04:59:01    331     1   5   0   1    12264
STMRSE3SET             ELT SYMB      28 SEP 76   04:59:03    332     1   5   0   1    12265
STMUSING               ELT SYMB      28 SEP 76   04:59:04    333     4   5   0   1    12266
STMRSE3US              ELT SYMB      28 SEP 76   04:59:06    334     1   5   0   1    12270
STMRSE3REC             ELT SYMB      28 SEP 76   04:59:08    335     1   5   0   1    12271
STMRSE3                ELT SYMB      28 SEP 76   04:59:09    336     1   5   0   1    12272
STMRSE4SEQU            ELT SYMB      28 SEP 76   04:59:11    337     3   5   0   1    12273
STMRSE43SET            ELT SYMB      28 SEP 76   04:59:12    338     2   5   0   1    12276
STMRSE44SET            ELT SYMB      28 SEP 76   04:59:14    339     2   5   0   1    12278
STMRSE43RLM            ELT SYMB      28 SEP 76   04:59:16    340     2   5   0   1    12280
STMRSE44RLM            ELT SYMB      28 SEP 76   04:59:18    341     2   5   0   1    12282
STMRSE44REC            ELT SYMB      28 SEP 76   04:59:19    342     2   5   0   1    12284
STMRSE45REC            ELT SYMB      28 SEP 76   [illegible] 343  [illegible] 5 0 1    12286
STMRSE4                ELT SYMB      28 SEP 76   04:59:24    344     3   5   0   1    12288
STMRSE5REC             ELT SYMB      28 SEP 76   04:59:26    345     3   5   0   1    12291
STMRSE5OPREC           ELT SYMB      28 SEP 76   04:59:28    346     2   5   0   1    12294
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STMRSESSET     ELT SYMB       28 SEP 76  04:59:30   347          2  5  0  1         12296
STMRSESRLM     ELT SYMB       28 SEP 76  04:59:32   348          2  5  0  1         12298
STMRSES        ELT SYMB       28 SEP 76  04:59:33   349          1  5  0  1         12300
STMRSE6        ELT SYMB       28 SEP 76  04:59:35   350          2  5  0  1         12301
STMRSE7DEF     ELT SYMB       28 SEP 76  04:59:37   351          2  5  0  1         12303
STMRSE7SET     ELT SYMB       28 SEP 76  04:59:38   352          2  5  0  1         12305
STMRSE7        ELT SYMB       28 SEP 76  04:59:40   353          2  5  0  1         12307
STMFINDFET     ELT SYMB       28 SEP 76  04:59:43   354          1  5  0  1         12309
STMACQINT      ELT SYMB       28                                                    
[illegible]    ELT SYMB       28 SEP 76  04:59:45   355                             12310
STMACQSET      ELT SYMB       28 SEP 76  04:59:47   356          3  5  0  1         12316
STMACODEF      ELT SYMB       28 SEP 76  04:59:50   357          1  5  0  1         12319
STMACQBODY     ELT SYMB       28 SEP 76  04:59:52   358          2  5  0  1         12320
STMTENANCY     ELT SYMB       28 SEP 76  04:59:54   359          1  5  0  1         12322
STMMEMBER      ELT SYMB  -Q   28 SEP 76  04:59:56   360          4  5  0  1         12323
STMIF          ELT SYMB  -Q   28 SEP 76  04:59:58   361          2  5  0  1         12327
FDIINCLUDE     ELT SYMB  -Q   28 SEP 76  05:00:00   362          3  5  0  1         12329
INVOKE         ELT SYMB       28 SEP 76  05:00:02   363         11  5  0  1         12332
AREACODES      ELT SYMB  -Q   28 SEP 76  05:00:07   364         36  5  0  1         12343
SETCODES       ELT SYMB       28 SEP 76  05:00:09   365          4  5  0  1         12379
GENCODES       ELT SYMB  -Q   28 SEP 76  05:00:11   366          9  5  0  1         12383
RECORDCODES    ELT SYMB       28 SEP 76  05:00:12   367          7  5  0  1         12392
CODESDCL       ELT SYMB       28 SEP 76  05:00:14   368          8  5  0  1         12399
FSSP           ELT SYMB       28 SEP 76  05:00:16   369          2  5  0  1         12407
FDMLP          OMNIBUS        28 SEP 76  05:02:26   370        846                  12409
ER-DML         OMNIBUS        28 SEP 76  05:04:13   371        756                  13255
LNK            ELT SYMB       28 SEP 76  05:04:25   372        188  5  0  1         14011
ENVELOPE       RELOCATABLE    28 SEP 76  05:04:45   373   12    11                  14199
MAPFSSP        RELOCATABLE    28 SEP 76  05:05:02   374    2    35                  14222
COMFSSP        ELT SYMB       28 SEP 76  05:05:05   375         11  5  0  1         14259
FSSP           ELT SYMB       28 SEP 76  05:05:07   376         10  5  0  1         14270
MAPFDMLP       ABSOLUTE       28 SEP 76  05:05:58   377        834           QTR    14280
COMFDMLP       ELT SYMB       28 SEP 76  05:06:08   378         11  5  0  1         15114
FDMLP          ELT SYMB       28 SEP 76  05:06:10   379         10  5  0  1         15125
               ABSOLUTE       28 SEP 76  05:06:38   380        834           QTR    15135
NEXT AVAILABLE LOCATION-                                                            15969

ASSEMBLER PROCEDURE TABLE EMPTY

COBOL PROCEDURE TABLE EMPTY

FORTRAN PROCEDURE TABLE EMPTY

ENTRY POINT TABLE EMPTY

@PRT,S F3.TCF
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Appendix B: F3 and F4 Listings

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LEE*F3(1).TCF
        *DH01C                                                       6F21
        -1117/3                                                      6F21
                 TNZ      TRUDI5                .   ANY ERROR ?
        *DH52C                                                       6F00
        -76,76                                                       6F00
                 TZ       BUTD19,X3             .   ANY RUN UNIT QUEUED ?
        *IV02C                                                       6E68
        -2239/3,3                                                    6E68
                 L,U      R1,5                  .   SET LOOP CONTROL                 6E68
                 L        A10,('      ')        .   PICK UP SPACES                   6E68
                 LDSC     A10,6                 .   LEFT JUSTIFY NEXT REEL NUMBER    6E68
                 TNE      A10,('      ')        .                                    6E68
                 JGD      R1,$-2                .                                    6E68
                 .                                                                   6E68
                 DSC      A10,6                 .   NEXT REEL NUMBER IS NOW          6E68
                 S        A11,0,X11             .   LEFT JUSTIFIED                   6E68
        -2555,2555                                                   6E68
        -2562/3,3                                                    6E68
                 S        A10,ATT016,X8         .   SET RP NUMBER INTO SOR BLOCK     6E68
        -2620                                                        6E68
                 L        A0,X10                .   POINT A0 AT TSWAP PKT            6E68
        -2692,2692                                                   6E68
                 L        A0,(1,IV02FR)         .   FORKS REQUEST PKT                6E68
        -2695,2695                                  FORK TO ACTIVITY TO GET          6E68
                 ER       FORK$                 .   NEXT REEL NUMBER                 6E68
                 .                                                                   6E68
        -2695/6,7                                                    6E68
                 L        A10,0,X6              .   PICK UP NEXT REEL NUMBER         6E68
        -2696/0,3                                                    6E68
        -2659                                                        6E68
                 L        A0,X10                .   POINT A0 AT TSWAP PKT            6E68
        -2659,2659                                                   6E68
                 SZ       ATTREL,X6             .   NO REELS BEEN USED YET           6E68
        *IV05C                                                       6F23
        -122,122                                                     6F23
                 AX,U     X9,7                  .   CORE ADDRESS
        *LINKERC                                                     6E39
        -167                                                         6E39
                 TE,U     A3,021                .   LOG COMMAND?                     6E39
                 J        LK0122E               .   NO - JUMP LK0122E                6E39
                 L,S2     A0,0,A1               .   YES - LOAD COMMAND FORMAT        6E39
                 TLE,U    A0,03                 .   FORMAT 3 OR 47                   6E39
                 J        LK0122E               .   NO - JUMP LK0122E                6E39
                 JGD      R1,LK0122E            .   YES - DECREMENT LOOP CONTROL     6E39
        LK0122E .                                                    6E39
        *LONGRECOVERY                                                6A78
        -32/1                                                        6A78
                 TZ       DSF017,X10            .   LEAVE RRLNUM ALONE IF ZERO ATTREL  6A78
        -380,380                                                     6A78
                 TE,U     A15,0200              .   TIME/DATE STAMP IN A14 ?         6A78
        -1201,1201                                                   6A78
        -1205/0                                                      6A78
                 L,U      A1,1                  .   SET RRLNUM TO ONE IF ZERO ATTREL   6A78
                 TZ       DSF017,X10            .   ZERO ATTREL IN SYSTEM FILE ?     6A78
        -1206                                                        6A78
                 S        A0,CRLNUM             .   SET UP CURRENT REEL NUMBER       6A78

OPRT,S F3.S65
FURPUR 27R2   RL72R1 10/09/76 11:59:52
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LEE*F3(1).SGS
 1     SGS
 2     DDLD      FILC       FILE-HANDLER          NOTSCH
 3     DDLD      RFPSC      RFPS                  NOTSCH
 4     DDLD      INIC       INIT                  SCHEMA
 5     DDLD      DDLSC      DDL-SCAN              SCHEMA
 6     DDLD      FIXC       FIXUP                 NOTSCH
 7     DDLD      IMAC       IMAGE                 NOTSCH
 8     [illegible]                                NOTSCH
 9     DDLD      STUC       STUFF                 NOTSCH
10     DDLD      SYNC       SYNTAX                NOTSCH
11     DDLD      LOGC       LOGIC-VERIFY           SCHEMA
12     DMLD      NNLC       NNLT                  NOTDSW   NOTSCH
13     DMLD      DRMC       DRMWRT                NOTDSW   NOTSCH
14     DMLD      ITRC       ITREAD                NOTDSW   NOTSCH
15     DMLD      ITWC       ITWRIT                NOTDSW   NOTSCH
16     DMLD      INCC       INCLUD                NOTDSW   NOTSCH
17     DMLD      NAMC       NAMETB                NOTDSW   NOTSCH
18     DMLD      NLIC       NLIT                  NOTDSW   NOTSCH
19     DMLD      SCAC       SCAN                  NOTDSW   NOTSCH
20     DMLD      PRCC       PRCDIV                NOTDSW   NOTSCH
21     DMLD      DMLC       DMLSGP                NOTDSW   NOTSCH
22     DMLD      COMC       COMSEC                DSWORK   NOTSCH
23     DMLD      COOC       COOR                  NOTDSW   NOTSCH
24     DMLD      DATC       DATCOM                NOTDSW   NOTSCH
25     DMLD      DCMC       DCMNTS                NOTDSW   SCHEMA
26     DMLD      DGEC       DGEND                 NOTDSW   NOTSCH
27     DMLD      IEDC       IEDDIV                NOTDSW   SCHEMA
28     DMLD      INVC       INVOKE                NOTDSW   NOTSCH
29     DMLD      LEVC       LEVEL                 DSWORK   SCHEMA
30     DMLD      LVEC       LVENO                 NOTDSW   NOTSCH
31     DMLD      MAIC       MAIN                  NOTDSW   SCHEMA
32     DMLD      PDMC       PDMIFS                NOTDSW   NOTSCH
33     DMLD      PDOC       PDOCRI                NOTDSW   NOTSCH
34     DMLD      PGHC       PGHDDM                NOTDSW   NOTSCH
35     DMLD      PHAC       PHASE2                NOTDSW   NOTSCH
36     DMLD      PICC       PICSIZ                NOTDSW   NOTSCH
37     DMLD      PRDC       PRDCOM                NOTDSW   NOTSCH
38     DMLD      RECC       RECSND                NOTDSW   NOTSCH
39     DMLD      REFC       REFRMT                NOTDSW   NOTSCH
40     DMLD      RELC       RELGEN                NOTDSW   NOTSCH
41     DMLD      LEXXC      LEX                   NOTDSW   NOTSCH
42     DMLD      SNMC       SNMTBL                NOTDSW   NOTSCH
43     ADMLPS    ANNLC      NNLT                  NOTDSW   NOTSCH
44     ADMLPS    ADRMC      DRMWRT                NOTDSW   NOTSCH
45     ADMLPS    AITRC      ITREAD                NOTDSW   NOTSCH
46     ADMLPS    AITWC      ITWRIT                NOTDSW   NOTSCH
47     ADMLPS    AINCC      INCLUD                NOTDSW   NOTSCH
48     ADMLPS    ANAMC      NAMETB                NOTDSW   NOTSCH
49     ADMLPS    ANLIC      NLIT                  NOTDSW   NOTSCH
50     ADMLPS    ASCAC      SCAN                  NOTDSW   NOTSCH
51     ADMLPS    APRCC      PRCDIV                NOTDSW   NOTSCH
52     ADMLPS    ADMLC      DMLSGP                NOTDSW   NOTSCH
53     ADMLPS    ACOOC      COOR                  DSWORK   NOTSCH
54     ADMLPS    ADATC      DATCOM                NOTDSW   NOTSCH
55     ADMLPS    ADCMC      DCMNTS                NOTDSW   SCHEMA
56     ADMLPS    ADGEC      DGEND                 NOTDSW   NOTSCH
57     ADMLPS    AIEDC      IEDDIV                NOTDSW   SCHEMA
58     ADMLPS    AINVC      INVOKE                NOTDSW   NOTSCH
59     ADMLPS    ALEVC      LEVEL                 DSWORK   SCHEMA
60     ADMLPS    ALVEC      LVENO                 NOTDSW   NOTSCH
61     ADMLPS    AMAIC      MAIN                  NOTDSW   SCHEMA
62     ADMLPS    APDMC      PDMIFS                NOTDSW   NOTSCH
63     ADMLPS    APDOC      PDOCRI                NOTDSW   NOTSCH
64     ADMLPS    APGHC      PGHDDM                NOTDSW   NOTSCH
65     ADMLPS    APHAC      PHASE2                NOTDSW   NOTSCH
66     ADMLPS    APICC      PICSIZ                NOTDSW   NOTSCH
67     ADMLPS    APRDC      PRDCOM                NOTDSW   NOTSCH
68     ADMLPS    AREFC      REFRMT                NOTDSW   NOTSCH
69     ADMLPS    ARELC      RELGEN                NOTDSW   NOTSCH
70     ADMLPS    ALEXXC     LEX                   NOTDSW   NOTSCH
71     ADMLPS    ASNMC      SNMTBL                NOTDSW   NOTSCH
72     DMRFLAG    SORTBUFC  SORTBUF          NOT NOT NOT DSW NOT
73     DMRFLAG   LINKERC        LINKER SGP TAB PAK DSW NOT
74     DMRFLAG   LSINKRC    LSINKR                SGP TAB PAK DSW NOT
75     DMRFLAG    IVO0C     IVO0        SGP TAB PAK DSW SCH
76     DMRFLAG    IVO1C     IVO1        SGP TAB PAK DSW NOT
77     DMRFLAG    IVO2C     IVO2        SGP TAB PAK DSW NOT
78     DMRFLAG    IVO3C     IVC3        SGP TAB PAK DSW SCH
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5949

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 79   DHRFLAG     IV04C     IV04               SGP TAB PAK DSW NOT              6A41
 80   DHRFLAG     IV05C     IV05       SGP TAB NOT DSW NOT
 81   DHRFLAG     IV06C     IV06       SGP TAB NOT DSW NOT
 82   DHRFLAG     IV07C     IV07       SGP TAB NOT DSW NOT
 83   DHRFLAG     IV08C     IV08       SGP TAB NOT DSW NOT
 84   DHRFLAG     IV09C     IV09       SGP TAB NOT NOT NOT
 85   DHRFLAG     TC01C     TC01            SGP TAB PAK DSW NOT
 86   DHRFLAG     TC04C     TC04               SGP TAB PAK DSW NOT              6A41
 87   DHRFLAG     TC06C     TC06           NOT TAB PAK DSW NOT                  5030
 88   DHRFLAG     TC09C     TC09       SGP TAB PAK DSW NOT
 89   DHRFLAG     TC13C     TC13       SGP TAB PAK DSW NOT
 90   DHRFLAG     TC14C     TC14               SGP TAB NOT DSW NOT
 91   DHRFLAG     TC15C     TC15       SGP TAB PAK DSW SCH
 92   DHRFLAG     TC16C     TC16            SGP TAB PAK DSW NOT
 93   DHRFLAG     TC17C     TC17       SGP TAB PAK DSW SCH
 94   DHRFLAG     DC02C     DC02       SGP TAB PAK DSW SCH
 95   DHRFLAG     DC0301C   DC0301     NOT TAB PAK DSW NOT
 96   DHRFLAG     DC0302C   DC0302          SGP TAB PAK DSW NOT
 97   DHRFLAG     DC0303C   DC0303          SGP TAB PAK DSW SCH
 98   DHRFLAG     DC0305C   DC0305          SGP TAB PAK DSW SCH
 99   DHRFLAG     DC0306C   DC0306          SGP TAB PAK DSW NOT
100   DHRFLAG     DC0307C   DC0307          SGP TAB PAK DSW SCH
101   DHRFLAG     DC05C     DC05           NOT TAB PAK DSW SCH                  5030
102   DHRFLAG     DC07C     DC07            SGP TAB PAK DSW SCH
103   DHRFLAG     DC08C     DC08       SGP TAB PAK DSW SCH
104   DHRFLAG     DC11C     DC11            SGP TAB PAK DSW SCH
105   DHRFLAG     DC12C     DC12            SGP TAB PAK DSW SCH
106   DHRFLAG     DC14C     DC14            SGP TAB PAK DSW SCH
107   DHRFLAG     DC21C     DC21            SGP TAB PAK DSW SCH
108   DHRFLAG     TH01C     TH01       SGP TAB NOT DSW NOT
109   DHRFLAG     TH02C     TH02       SGP TAB NOT DSW NOT
110   DHRFLAG     TH03C TH03                   SGP TAB NOT DSW NOT              5949
111   DHRFLAG     TH04C     TH04            SGP TAB PAK DSW NOT
112   DHRFLAG     TH05C     TH05       SGP TAB NOT DSW NOT                      5489
113   DHRFLAG     TH06C TH06                   SGP TAB NOT DSW SCH              5949
114   DHRFLAG     TH08C     TH08       NOT TAB PAK DSW NOT
115   DHRFLAG     TH09C     TH09       SGP TAB NOT DSW SCH
116   DHRFLAG     TH12C     TH12       NOT TAB NOT DSW NOT
117   DHRFLAG     TH14C     TH14       NOT TAB NOT DSW NOT
118   DHRFLAG     TH15C     TH15            SGP TAB PAK DSW NOT
119   DHRFLAG     TH17C     TH17            SGP TAB PAK DSW NOT
120   DHRFLAG     TH20C     TH20       SGP TAB NOT DSW SCH
121   DHRFLAG     DH01C     DH01       SGP TAB NOT DSW NOT
122   DHRFLAG     DH03C     DH03       NOT TAB NOT DSW NOT
123   DHRFLAG     DH04C     DH04       SGP NOT NOT DSW NOT                      5367
124   DHRFLAG     DH05C     DH05            SGP TAB NOT DSW SCH
125   DHRFLAG     DH07C     DH07            SGP TAB PAK DSW SCH
126   DHRFLAG     DH08C     DH08       NOT TAB NOT DSW SCH
127   DHRFLAG     DH09C     DH09       SGP TAB PAK DSW SCH                      5489
128   DHRFLAG     DH10C     DH10       SGP TAB NOT DSW SCH                      4403
129   DHRFLAG     DH11C     DH11               SGP TAB PAK DSW SCH              6A41
130   DHRFLAG     DH12C     DH12       NOT TAB NOT DSW SCH
131   DHRFLAG     DH13C     DH13       NOT TAB NOT NOT NOT
132   DHRFLAG     DH14C     DH14       SGP TAB NOT DSW NOT                      5796
133   DHRFLAG     DH16C     DH16       SGP TAB NOT DSW SCH                      5357
134   DHRFLAG     DH17C     DH17            SGP TAB NOT DSW SCH
135   DHRFLAG     DH18C     DH18       NOT TAB NOT DSW NOT
136   DHRFLAG     DH19C     DH19       SGP TAB PAK DSW SCH                      4403
137   DHRFLAG     DH20C     DH20       SGP TAB PAK DSW NOT
138   DHRFLAG     DH21C     DH21       NOT TAB NOT DSW SCH
139   DHRFLAG     DH22C     DH22       SGP TAB NOT NOT SCH
140   DHRFLAG     DH23C     DH23       SGP TAB NOT DSW SCH                      5357
141   DHRFLAG     DH24C     DH24               SGP TAB NOT DSW NOT
142   DHRFLAG     DH25C     DH25       SGP TAB PAK DSW NOT                      5357
143   DHRFLAG     DH26C     DH26       NOT TAB NOT DSW SCH
144   DHRFLAG     DH27C     DH27       SGP TAB NOT DSW SCH                      5489
145   DHRFLAG     DH28C     DH28       SGP TAB NOT DSW SCH                      5489
146   DHRFLAG     DH29C     DH29       SGP TAB PAK DSW SCH                      5357
147   DHRFLAG     DH30C     DH30               SGP TAB PAK DSW SCH              6A41
148   DHRFLAG     DH31C     DH31       NOT TAB NOT DSW SCH
149   DHRFLAG     DH34C     DH34       NOT TAB NOT DSW SCH
150   DHRFLAG     DH35C     DH35       SGP TAB NOT DSW SCH
151   DHRFLAG     DH36C     DH36            SGP TAB PAK DSW SCH                 4290
152   DHRFLAG     DH37C     DH37       NOT TAB NOT DSW SCH
153   DHRFLAG     DH38C     DH38       SGP TAB NOT DSW SCH
154   DHRFLAG     DH39C     DH39       SGP TAB NOT DSW SCH
155   DHRFLAG     DH40C     DH40       SGP TAB NOT DSW SCH
156   DHRFLAG     DH42C     DH42       SGP TAB PAK DSW SCH                      4403
157   DHRFLAG     DH43C     DH43       SGP TAB PAK DSW SCH                      4403
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158   DMRFLAG   DH44C     DH44       SGP TAB PAK DSW SCH
159   DMRFLAG   DH45C     DH45       SGP TAB PAK DSW SCH                    4403
160   DMRFLAG   DH46C     DH46       SGP TAB NOT DSW SCH                    4403
161   DMRFLAG   DH47C     DH47       SGP TAB PAK DSW SCH                    4403
162   DMRFLAG   DH50C     DH50       NOT TAB PAK DSW SCH                    6357
163   DMRFLAG   DH51C     DH51       NOT TAB NOT DSW SCH
164   DMRFLAG   DH52C     DH52    NOT TAB NOT DSW NOT
165   DMRFLAG   CA01C     CA01       SGP TAB NOT NOT NOT                    5401
166   DMRFLAG   CA02C     CA02       SGP TAB NOT DSW NOT
167   DMRFLAG   CA03C     CA03       NOT TAB NOT NOT NOT
168   DMRFLAG   CA04C     CA04       SGP TAB NOT NOT NOT
169   DMRFLAG   CA05C     CA05       SGP TAB NOT NOT NOT                    4403
170   DMRFLAG   I001C     I001       SGP TAB NOT DSW NOT
171   DMRFLAG   I002C     I002       SGP TAB NOT NOT NOT                    5796
172   DMRFLAG   I005C     I005       NOT TAB NOT NOT NOT
173   DMRFLAG   RR01C     RR01       SGP TAB NOT DSW NOT
174   DMRFLAG   RR05C     RR05       SGP TAB NOT DSW NOT
175   DMRFLAG   UT01C     UT01       SGP TAB PAK NOT NOT
176   DMRFLAG   UT02C     UT02       SGP TAB NOT DSW NOT
177   DMRFLAG   UT03C     UT03           SGP TAB NOT NOT NOT                4253
178   DMRFLAG   UT04C     UT04       SGP TAB PAK DSW SCH
179   DMRFLAG   GS01C     GS01       SGP TAB NOT NOT NOT                    4253
180   DMRFLAG   GS02C     GS02       SGP TAB PAK DSW NOT
181   DMRFLAG   GS03C     GS03       SGP TAB NOT NOT NOT                    5796
182   DMRFLAG   GS04C     GS04       SGP TAB NOT NOT NOT
183   DMRFLAG   GS07C     GS07       SGP TAB NOT NOT NOT
184   DMRFLAG   GS09C     GS09       SGP TAB NOT DSW NOT
185   DMRFLAG   GS10C     GS10       NOT TAB PAK DSW NOT
186   DMRFLAG   GS11C     GS11       SGP TAB NOT NOT NOT
187   DMRFLAG   GS12C     GS12       SGP TAB NOT DSW NOT
188   DMRFLAG   GS13C     GS13           SGP TAB NOT DSW NOT                4587
189   SEGSPECIAL SGLOADC  SGLOAD             SGP TAB NOT NOT NOT
190   SEGSPECIAL RESSEGC  RESSEG             NOT TAB NOT NOT NOT          4587
191   REPSGP  LINKERC LINKER         SGP TAB PAK DSW NOT                    4587
192   REPSGP      LSINKRC     LSINKR         SGP TAB PAK DSW NOT
193   REPSGP      IV00C       IV00       SGP TAB PAK DSW SCH                5949
194   REPSGP      IV01C       IV01       SGP TAB PAK DSW NOT
195   REPSGP      IV02C       IV02       SGP TAB PAK DSW NOT
196   REPSGP      IV03C       IV03       SGP TAB PAK DSW SCH
197   REPSGP      IV05C       IV05       SGP TAB NOT DSW NOT
198   REPSGP      IV06C       IV06           SGP TAB NOT DSW NOT
199   REPSGP      IV07C       IV07       SGP TAB NOT DSW NOT
200   REPSGP      IV08C       IV08       SGP TAB NOT DSW NOT
201   REPSGP      IV09C       IV09       SGP TAB NOT NOT NOT
202   REPSGP      TC09C       TC09         SGP TAB PAK DSW NOT
203   REPSGP      TC13C       TC13       SGP TAB PAK DSW NOT
204   REPSGP      TC15C       TC15       SGP TAB PAK DSW SCH
205   REPSGP      TC17C       TC17       SGP TAB PAK DSW SCH
206   REPSGP      TH09C       TH09       SGP TAB NOT DSW SCH
207   REPSGP      DH01C       DH01       SGP TAB NOT DSW NOT
208   REPSGP      DH17C       DH17           SGP TAB NOT DSW SCH
209   REPSGP      DH25C       DH25         SGP TAB NOT DSW NOT
210   REPSGP      I002C       I002       SGP TAB NOT NOT NOT
211   REPSGP      RR01C       RR01       SGP TAB NOT DSW NOT
212   REPSGP      RR05C       RR05       SGP TAB NOT DSW NOT
213   REPSGP      UT01C       UT01         SGP TAB PAK NOT NOT
214   REPSGP      GS02C       GS02       SGP TAB NOT NOT NOT
215   REPSGP      GS04C       GS04         SGP TAB NOT NOT NOT              6C59
216   REPSGP      GS07C       GS07       SGP TAB NOT NOT NOT
217   REPSGP|     TIMERC      TIMER      SGP TAB NOT DSW NOT
218   REPSGP|     OLINITC     OLINIT             SGP NOT NOT NOT NOT
219   REPSGP|     SFINITC     SFINIT             SGP TAB PAK NOT NOT
220   REPSGP|     DTBSDMP1C DTBSDMP1             SGP TAB PAK DSW NOT
221   REPSGP|     DTBSDMP2C DTBSDMP2             SGP TAB PAK NOT NOT
222   REPSGP|     DYNDUMPC    DYNDUMP            SGP TAB NOT DSW NOT
223   REPSGP|     QUIRECC     QUIREC             SGP NOT NOT DSW NOT        5781
224   REPSGP|     DMRACTC     DMRACT             SGP TAB NOT DSW NOT
225   REPSGP|     UPDATEC     UPDATE             SGP TAB NOT NOT NOT
226   REPSGP|     DMRCLRC     DMRCLR     SGP TAB NOT DSW NOT
227   REPSGP|     LONGRECOVERY LONGRECOVERY      SGP TAB NOT NOT NOT
228   REPSGP|     CHECKPOINTC CHECKPOINT         SGP TAB NOT DSW NOT
229   REPSGP|     TIPCOPYC  TIPCOPY          SGP TAB NOT NOT SCH
230   DMUFLAG   AREAC   AREALIST       NOT TAB NOT DSW SCH NOT  UTAB
231   DMUFLAG   CDC  CD                NOT NOT NOT NOT NOT NOT  UTAB
232   DMUFLAG   CERRC CERR             NOT TAB NOT NOT NOT NOT  UTAB
233   DMUFLAG   CLOSEC CLOSE           NOT NOT NOT DSW NOT NOT  UTAB
234   DMUFLAG   CODEC   CODE           NOT TAB PAK DSW SCH NOT  UTAB
235   DMUFLAG  CPC CP                  SGP NOT NOT NOT NOT NOT UTAB
236   DMUFLAG   DMUSCANC  DMU-SCAN     SGP TAB NOT NOT NOT DMUP UTAB        5645
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237     DMUFLAG   IMAGEC IMAGE                  SGP NOT NOT NOT NOT DMUP NOT
238     DMUFLAG   SYNTAXC  SYNTAX               NOT NOT NOT NOT NOT DMUP NOT
239     DMUFLAG   UTILITYC UTILITY              SGP NOT NOT DSW NOT NOT  UTAB
240     DMUFLAG   INITC INIT                    NOT NOT NOT NOT NOT DMUP UTAB
241     DMUFLAG   INITIALIZEC INITIALIZE        NOT TAB NOT NOT NOT NOT  UTAB
242     DMUFLAG   LEXICONC LEXICON              NOT NOT NOT NOT NOT DMUP NOT
243     DMUFLAG    CALCVERC   CALCVER               NOT TAB PAK DSW SCH DMUP UTAB
244     DMUFLAG    FDASCC     FDASC                 NOT NOT NOT NOT NOT NOT NOT
245     DMUFLAG    INFORSC    INFORS                NOT NOT NOT NOT NOT NOT NOT
246     DMUFLAG    PREPROC    PREPRO          NOT NOT NOT NOT NOT NOT NOT
247     DMUFLAG    SDFIC      SDFI                  NOT NOT NOT NOT NOT NOT NOT
248     DMUFLAG    SDFOC      SDFO                  NOT NOT NOT NOT NOT NOT NOT
249     DMUFLAG    SIRASHC    SIRASH                NOT NOT NOT NOT NOT NOT NOT
250     DMUFLAG    SIRTABC    SIRTAB                NOT NOT NOT NOT NOT NQT NOT
251     DMUFLAG   PAGCOMC PAGCOM                NOT TAB NOT DSW NOT NOT  UTAB
252     DMUFLAG   PAGEC PAGE                    NOT TAB NOT NOT NOT NOT  UTAB
253     DMUFLAG   PAGEXPC  PAGEXP               SGP TAB NOT DSW NOT NOT  UTAB
254     DMUFLAG   PATCHC PATCH                  NOT TAB PAK DSW NOT NOT  UTAB
255     DMUFLAG   PRINTC PRINT                  SGP TAB PAK DSW NOT NOT  UTAB
256     DMUFLAG    DUMPC      DUMP                    NOT TAB NOT NOT NOT NOT UTAB
257     DMUFLAG               PRT1OC PRT10            NOT TAB NOT NOT NOT NOT UTAB
258     DMUFLAG               PRT20C PRT20            NOT TAB NOT DSW NOT NOT UTAB
259     DMUFLAG    PRT30C     PRT30                 NOT TAB PAK DSW NOT NOT UTAB
260     DMUFLAG    SELRECC    SELREC          SGP TAB PAK DSW NOT NOT  UTAB
261     DMUFLAG    CALLPAC    CALLPA          NOT TAB NOT NOT NOT NOT  UTAB
262     DMUFLAG    SV12C      SV12            NOT TAB NOT DSW NOT NOT  UTAB
263     DMUFLAG    DBKPRTC    DBKPRT          NOT TAB PAK DSW SCH NOT  UTAB
264     DMUFLAG    CYDIVC     CYDIV           NOT NOT NOT NOT NOT NOT  NOT
265     DMUFLAG    BINFOC     BINFO           NOT NOT NOT NOT NOT NOT  NOT
266     DMUFLAG    STATC      STAT            SGP TAB NOT NOT NOT NOT  UTAB
267     DMUFLAG    USERC      USER            NOT TAB NOT NOT NOT DMUP UTAB
268     DMUFLAG    AEDITSC    AEDITS          NOT NOT NOT NOT NOT NOT  NOT
269     DMUFLAG   RRDTC RRDT                    NOT NOT NOT NOT NOT NOT  NOT
270     DMUFLAG   SAVC SAV                      NOT NOT NOT NOT NOT NOT  NOT
271     DMUFLAG    SDTC  SDT                    NOT TAB NOT NOT SCH NOT  UTAB
272     DMUFLAG    STUFFC   STUFF               NOT NOT NOT NOT NOT DMUP NOT
273     DMUFLAG    SVCONVC  SVCONV              NOT NOT NOT NOT NOT NOT  UTAB
274     DMUFLAG    SV01C    SV01                SGP TAB NOT DSW NOT NOT  UTAB
275     DMUFLAG    SV02C    SV02                NOT NOT NOT NOT NOT NOT  UTAB
276     DMUFLAG    SV03C    SV03                NOT TAB NOT DSW NOT NOT  UTAB
277     DMUFLAG    SV04C    SV04                NOT TAB NOT DSW SCH NOT  UTAB
278     DMUFLAG    SV05C    SV05                NOT TAB NOT DSW NOT NOT  UTAB
279     DMUFLAG    SV06C    SV06                NOT TAB NOT NOT NOT NOT  UTAB
280     DMUFLAG    SV07C    SV07                NOT NOT NOT NOT NOT NOT  UTAB
281     DMUFLAG    SV08C    SV08                SGP NOT NOT NOT NOT NOT  UTAB
282     DMUFLAG    SV09C    SV09                SGP TAB NOT NOT NOT NOT  UTAB
283     DMUFLAG    SV10C    SV10                NOT NOT NOT NOT NOT NOT  UTAB
284     DMUFLAG    SV11C    SV11                NOT NOT NOT DSW NOT NOT  UTAB
285     DMUFLAG    SV13C    SV13                NOT NOT NOT NOT NOT NOT  UTAB
286     DMUFLAG    SV16C    SV16                NOT TAB NOT NOT NOT NOT  UTAB
287     DMUFLAG    SV17C    SV17                NOT TAB NOT DSW NOT NOT  UTAB
288     DMUFLAG    SV19C    SV19                NOT TAB NOT DSW NOT NOT  UTAB
289     DMUFLAG    SV20C    SV20                NOT NOT NOT NOT NOT NOT  UTAC
290     DMUFLAG    SV21C    SV21                NOT TAB NOT DSW NOT NOT  UTAB
291     DMUFLAG    SV25C    SV25                NOT TAB NOT DSW NOT NOT  UTAB
292     DMUFLAG    SV26C    SV26                NOT TAB NOT DSW NOT NOT  UTAB
293     DMUFLAG    SV99C    SV99                SGP TAB NOT DSW NOT NOT  UTAB
294     DMUFLAG    LOADSGC LOADSG               NOT NOT NOT NOT NOT NOT  UTAB
295     DMUPLUS    DOWNC      DOWN                NOT NOT NOT NOT NOT NOT NOT
296     DMUPLUS    UPC        UP                  NOT NOT NOT NOT NOT NOT NOT
297     SPECIAL    TABLEN TABLENS
298     SPECIAL    BUTLEN BUTLENS
299     SPECIAL    ARLLEN ARRLLENS
300     SPECIAL    RRLLEN RRLLENS
301     SPECIAL  SNOP SNOPS
302     SPECIAL    SRLLEN SRLLENS
303     SPECIAL    PAGLEN PAGLENS
304     SPECIAL    ATT ATTS
305     SPECIAL   ATASGK ATASGKS
306     SPECIAL   SFASGK SFASGKS
307     SPECIAL    QLF QLFS
308     SPECIAL    TIMRON TIMRONS
309     SPECIAL    REPON REPONS
310     SPECIAL    RUACT RUACTS
311     SPECIAL    RLIST RLISTS
312     ATTS       IV00C      IV00
313     ATTS       IV02C      IV02
314     ATTS       IV04C      IV04
315     ATTS       TC13C      TC13
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ATTS        TC15C       TC15
ATTS        TC17C       TC17
ATTS        DM01C       DM01
ATTS        I002C       I001
ATTS        RR01C       RR01
ATTS        MM05C       MM05
ATTS        GS07C       GS07
QLFS        IV00C     IV00
QLFS        IV02C   IV02
QLFS        IV03C   IV03

QLFS        TC13C   TC13
QLFS        TC15C   TC15
QLFS        DM01C   DM01
QLFS        RR05C     RR05
TIMRONS     IV00C       IV00
REPONS      IV00C       IV00
REPONS      IV01C       IV01
REPONS      IV02C       IV02
REPONS      IV03C       IV03
REPONS      IV05C       IV05
REPONS      IV07C       IV07
REPONS      IV08C       IV08
REPONS      IV09C       IV09
REPONS      TC13C       TC13
REPONS      GS11C       GS11
RUACTS      DM36C       DM36
RLISTS      IV01C       IV01
RLISTS      IV02C       IV02
RLISTS      IV05C       IV05
RLISTS      IV07C       IV07
SNOPS       IV01C       IV01
SNOPS       GS09C       GS09
TABLENS     IV00C       IV00
TABLENS     CA01C       CA01
BUTLENS     IV00C       IV00
BUTLENS     DM01C       DM01
ARLLENS     IV00C       IV00
RRLLENS     IV00C       IV00
SRLLENS     IV00C       IV00
PAGLENS     IV00C       IV00
PAGLENS      CA01C      CA01
ATASGKS   IV02C  IV02
SFASGKS   IV02C  IV02
PR   SGPC DMSSGP DMSSGP VVV SGPFLAG
PR DMUPC DMUPROCS DMU-PROCS QQQ DMUPFLAG
PR  ACOPC  ACOPROC  ACOPROC  ZZZ ACOPFLAG
PR UTBC UTLTAB UTLTAB QQQ UTTFLAG
PR  SCHC  SCHEMA  SCHEMA TTT SCHFLAG
PR RFSC RFSPROC RFSPROC TTT RFSFLAG
PR COPC COPROC COPROC UUU COPFLAG
PR PAKC PACKET PACKET VVV PAKFLAG
PR TABC DMRTAB DMRTAB VVV TABFLAG
PR DSWC DSWORK DSWORK VVV DSWFLAG
PR  DDLPC DDLPROCS DDL-PROCS TTT DDLPFLAG
GENERATE  SKELC       SKEL            PCFF,DDL,DML,ADML,DMR,REPF,DMU
GENERATE  SGSC        SGS             PCFF,DDL,DML,ADML,DMR,REPF,DMU
GENERATE  USERSGSC  USERSGS           PCFF,DDL,DML,ADML,DMR,REPF,DMU
GENERATE  DDL-MAPC    DDL-MAP             DDL
GENERATE  DMLMAPC     DMLMAP              DML
GENERATE  ADMLPMAPC   ADMLPMAP            ADML
GENERATE  DMRMAPC     DMRMAP              DMR
GENERATE  DMRREPMAPC  DMRREPMAP           REPF
GENERATE  UTMAPSTC  UTMAPST               DMU
GENERATE  UTMAPMTC  UTMAPMT               DMU
GENERATE  UTMAPSEGRC  UTMAPSEGR           DMU
GENERATE  UTMAPSEGAC  UTMAPSEGA           DMU
GENERATE  DMUCOPYC  DMUCOPY               DMU
GENERATE  MAINC     MAIN                  DMU
GENERATE  MAIN-ASCIIC  MAIN-ASCII         DMU
GENERATE  DMRDEFC   DMRDEFINES            DMU
GENERATE  TABPLSC   DMRTABPLUS            DMU
GENERATE  DSWPLSC   DSWORKPLUS            DMU
GENERATE  UTBPLSC   UTLTABPLUS            DMU
.         *** CNTRLBNK DEFINES DMR ROUTINES WHICH MUST
.             BE IN THE DMR CONTROLBANK FOR MULTIBANKING
CNTRLBNK  IV01,IV03,TM01,GS09,GS07,GS10
MASG  IV00,IV01,IV02,IV03,IV04,|   . THE SGS 'MASG' DEFINES THE ELEMENTS    4507
 IV05,IV06,IV07,IV08,IV09,TM01,|   .    WHICH MUST BE IN THE MAINSEG        4507
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THO2,THO3,THO4,THO6,THO8,TH12,TH15,TH17,1
          THO6
 DHO1,DH14,CA01,CA02,CA03,CA04,CA05,1                                   5949
 GS01,GS02,GS03,GS04,GS07,GS09,GS10,GS12
NUMCARD 0 0 0,0 0,0                      . THIS DEFINES THE DEFAULT # OF         4587
COMMENT                                  . OVERLAY/SEGS, THE MIN/MAX # OF EACH   4587
SGTABLSIZ 1,1,0 0,3,1 0,3,1 0 1    . THIS DEFINES THE OVRLAY/SEG/EPT TABLES      4587
COMMENT . **IF THE EQU'S IN DMRTAB CHANGE, SGTABLSIZ MUST ALSO CHANGE            4587
TABLABOV  LABOV                          . LABEL IN DMRTAB FOR EPO TABLE         4587
SGLLABEP     LABEP EPSGLLEN              . 2 LABELS IN ELEMENT SGLOAD            4587
IV00LAB SGRESERV TABRES  EPTADD  OVTADD  SGTADD EPENT OVENT SGENT                4587
COMMENT . LABELS IN IV00 THAT SYSGEN MUST KNOW ABOUT                             4587
RESRVFILE      VVV   RESELT RESSEG RESSEGC . NAME OF FILE WITH RESERVE ELT       4587
SGLOV       OVSIZE                       . EQU IN SGLOAD THAT SYSGEN MUST SET UP 4587
SGLSEG      SEGSIZE                      . EQU IN SGLOAD THAT SYSGEN MUST SET UP 4587
COMMENT . ** THE SGS'S 'EPTT' DEFINE ALL THE DMR ENTRY POINTS                    4587
COMMENT . ** SYSGEN MUST KNOW ALL ENTRY POINTS FOR SEGMENTATION                  4587
COMMENT . ** IN ORDER TO SET UP THE CALL PROC .                                  4587
EPTT           IV00        IV00           0                                      4587
EPTT           IV01        IV01           0                                      4587
EPTT           IV01SGT     IV01           3                                      4587
EPTT           DC10        IV01        0    .
EPTT           IV02        IV02           0                                      5860
EPTT           IV03        IV03           0                                      4587
EPTT           IV03MM      IV03           2                                      4587
EPTT           IV03IEC     IV03           3                                      4587
EPTT           IV03MK      IV03           2
EPTT           IV03CALC    IV03        4  .
EPTT           IV04        IV04           0                                      4833
EPTT           IV05        IV05           0                                      4587
EPTT           IV0590      IV05           2                                      4587
EPTT           IV05CC      IV05           2                                      5736
EPTT           IV06        IV06           0                                      5014
EPTT           IV07        IV07           0                                      4587
EPTT           IV0700      IV07           2                                      4587
EPTT           IV0705      IV07           2                                      4587
EPTT           IV08        IV08           0                                      4587
EPTT           IV09        IV09           0
EPTT           IV09A0      IV09           2 .                                    4587
EPTT           IV09A       IV09             1
EPTT           IV0983      IV09             2                                  5905
EPTT           TC01        TC01             0                                    5786
EPTT           TC04        TC04           0                                      5786
EPTT           TC04A1      TC04           2                                      4587
EPTT           TC06        TC06           0                                      4587
EPTT           TC09        TC09           0                                      4587
EPTT           TC13        TC13           0                                      4587
EPTT           TC1301      TC13           2                                      4587
EPTT           TC1305      TC13           2                                      4587
EPTT           TC1340      TC13           2                                      4587
EPTT           TC1341      TC13           2                                      4587
EPTT           TC1370      TC13           2
EPTT           TC13XT      TC13           2
EPTT           TC13RT      TC13      2   .                                       5014
EPTT           TC14        TC14           0                                      5025
EPTT           TC1502      TC15           2                                      4587
EPTT           TC1510      TC15           2                                      4587
EPTT           TC16        TC16           0                                      4587
EPTT           TC17        TC17           0                                      4587
EPTT           DC02        DC02           0                                      4587
EPTT           DC026       DC02           1                                      4587
EPTT           DC0301      DC0301         2                                      4587
EPTT           DC0302      DC0302         2                                      4587
EPTT           DC0303      DC0303         2                                      4587
EPTT           DC3FNA      DC0303       2   .                                    4587
EPTT           DC3FFA      DC0303    2    :                                      5884
EPTT           DC3FLA      DC0303    2    .                                      5860
EPTT           DC0304      DC0303         2                                      5860
EPTT           DC0305      DC0305         2                                      4587
EPTT           DC0306      DC0306         2                                      4587
EPTT           DC0307      DC0307         2                                      4587
EPTT           DC3705      DC0307         2                                      4587
EPTT           DC3715      DC0307         2                                      4587
EPTT           DC05        DC05           0                                      4587
EPTT           DC05A       DC05           1                                      4587
EPTT           DC07        DC07           0                                      4587
EPTT           DC0700      DC07           2                                      4587
EPTT           DC08        DC08           0                                      4587
EPTT           DC11        DC11           0                                      4587
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474   EPTT   DC12      DC12            0
475   EPTT   DC1401    DC14            2      4587
476   EPTT   DC1402    DC14            2      4587
477   EPTT   DC21      DC21            0      4587
478   EPTT   THO1      THO1            0
479   EPTT   THO101    THO1            2      4587
480   EPTT   THO2      THO2            0      4587
481   EPTT   THO201    THO2            2      4587
482   EPTT   THO202    THO2            2      4587
483   EPTT   THO3DN    THO3            2      4587
484   EPTT   THO3RN    THO3            2      4587
485   EPTT   THO3RO  THO3 2          •        4587
486   EPTT   THO3RF    THO3      2  •         5949
487   EPTT   THO4      THO4            0      5949
488   EPTT   THO420    THO4            2      4587
489   EPTT   THO430    THO4            2      4587
490   EPTT   THO450    THO4            2      4587
491   EPTT   THO455    THO4            2      4587
492   EPTT   THO4600   THO4            3      4587
493   EPTT   THO4700   THO4            3
494   EPTT   THO4800   THO4            3
495   EPTT   THO490    THO4            2
496   EPTT   THO491    THO4            2      5830
497   EPTT   THO495    THO4            2      5830
498   EPTT   THO4900   THO4            3      5830
499   EPTT   THO455    THO4            2
500   EPTT   THO5      THO5            0      5019
501   EPTT   THO5A     THO5            1      4587
502   EPTT   THO5R     THO5            1      4587
503   EPTT   THO5S     THO5            1      4587
504   EPTT   THO5PA    THO5            2      4587
505   EPTT   THO5SPA   THO5              3    4587
506   EPTT   THO510    THO5            2      5357
507   EPTT   THO6      THO6            0      4587
508   EPTT   THO610    THO6            2      5949
509   EPTT   THO6249   THO6            3      5949
510   EPTT   THO8      THO8            0      5949
511   EPTT   THO805    THO8            2      4587
512   EPTT   THO9      THO9            0      4587
513   EPTT   THO9SA    THO9            2      4587
514   EPTT   THO9SC    THO9          2   •    5019
515   EPTT   TH12      TH12            0      6897
516   EPTT   TH14      TH14            0      4587
517   EPTT   TH15      TH15            0      4587
518   EPTT   TH1550    TH15            2      4587
519   EPTT   TH17      TH17            0      4587
520   EPTT   TH20      TH20            0      4587
521   EPTT   DHO1      DHO1            0      4587
522   EPTT   DHO1NE    DHO1            2      4587
523   EPTT   DHO3      DHO3            0      4587
524   EPTT   DHO4      DHO4            0      4587
525   EPTT   DHO5A     DHO5            1      5367
526   EPTT   DHO5B     DHO5            1
527   EPTT   DHO5      DHO5            0
528   EPTT   DHO7      DHO7            0      4587
529   EPTT   DHO8      DHO8            0      4587
530   EPTT   DHO876    DHO8            2      4587
531   EPTT   DHO886    DHO8            2      4587
532   EPTT   DHO9      DHO9            0      4587
533   EPTT   DH10      DH10            0      4587
534   EPTT   DH10CR    DH10            2      4587
535   EPTT   DH1101    DH11            2      4587
536   EPTT   DH1102    DH11            2      4587
537   EPTT   DH1103    DH11            2      4587
538   EPTT   DH1104    DH11            2      4587
539   EPTT   DH1105    DH11            2      4587
540   EPTT   DH1107    DH11              2    5357
541   EPTT   DH12      DH12            0      4587
542   EPTT   DH13      DH13            0      4587
543   EPTT   DH1401    DH14            2      4587
544   EPTT   DH1402    DH14            2      4587
545   EPTT   DH1403    DH14            2      4587
546   EPTT   DH16      DH16              0    5357
547   EPTT   DH17      DH17            0      4587
548   EPTT   OP18A     DH17            1      4587
549   EPTT   CL18A     DH17            1      4587
550   EPTT   WR18A     DH17            1      4587
551   EPTT   RD18A     DH17          1   •    6833
552   EPTT   SORT8A    DH17          2   •    6833
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553       EPTT      DH17CP1   DH17            3    •                6833
554       EPTT      DH18      DH18               0                  4587
555       EPTT      DH1807    DH18               2                  5392
556       EPTT      DH1850    DH18               2                  4687
557       EPTT      DH19      DH19               0                  4587
558       EPTT      DH20      DH20               0                  4587
559       EPTT      DH21      DH21               0                  4587
560       EPTT      DH22      DH22               0                  4587
561       EPTT      DH23      DH23               0                  5014
562       EPTT      DH24      DH24               0                  4587
563       EPTT      DH25      DH25               0                  4587
564       EPTT      DH26A     DH26               1                  4587
565       EPTT      DH26B     DH26               1                  4587
566       EPTT      DH27A     DH27               1                  4587
567       EPTT      DH27B     DH27               1                  4587
568       EPTT      DH27C     DH27               1                  5014
569       EPTT      DH27D     DH27                 1                5477
570       EPTT      DH27F     DH27                 1                5477
571       EPTT      DH27H     DH27                 1                5477
572       EPTT      DH28A     DH28               1                  4587
573       EPTT      DH28B     DH28               1                  4587
574       EPTT      DH28C     DH28               1                  5014
575       EPTT      DH28D     DH28                 1                5523
576       EPTT      DH28H     DH28                 1                5523
577       EPTT      DH29      DH29                 0         •      5837
578       EPTT      DH29A     DH29                 1           •    5837
579       EPTT      DH30A     DH30               1                  4587
580       EPTT      DH30AD    DH30               2                  4587
581       EPTT      DH30B     DH30               1                  4587
582       EPTT      DH31      DH31               0                  4587
583       EPTT      DH34      DH34               0                  4587
584       EPTT      DH35      DH35               0                  4587
585       EPTT      DH36A     DH36               1                  4587
586       EPTT      DH36AD    DH36               2
587       EPTT      DH36B     DH36               1                  4587
588       EPTT      DH36C     DH36               1                  4587
589       EPTT      DH36RT    DH36        2                  •        5060
590       EPTT      DH37      DH37               0                  4587
591       EPTT      DH38      DH38               0                  4587
592       EPTT      DH39      DH39               0                  4587
593       EPTT      DH3901    DH39               2                  4587
594       EPTT      DH40      DH40               0                  4587
595       EPTT      DH42      DH42               0                  4587
596       EPTT      DH42CL    DH42               2                  5014
597       EPTT      DH4201    DH42                 2  •             5357
598       EPTT      DH43      DH43               0                  4587
599       EPTT      DH43A     DH43                 1                5357
600       EPTT      DH43B     DH43                 1                5357
601       EPTT      DH43C     DH43                 1                5357
602       EPTT      DH44      DH44               0                  4587
603       EPTT      DH44A     DH44                 1                5357
604       EPTT      DH44B     DH44                 1                5357
605       EPTT      DH45      DH45               0                  4587
606       EPTT      DH45SPA   DH45                 3                5357
607       EPTT      DH46      DH46               0                  4587
608       EPTT      DH47      DH47        0                           5357
609       EPTT      DH5010    DH50               2                  4587
610       EPTT      DH5020    DH50               2                  4587
611       EPTT      DH5040    DH50               2                  4587
612       EPTT      DH5050    DH50               2                  4587
613       EPTT      DH5060    DH50               2                  4587
614       EPTT      DH5101    DH51               2                  4587
615       EPTT      DH5102    DH51               2                  4587
616       EPTT      DH5103    DH51               2                  4587
617       EPTT      DH52      DH52       0                            5601
618       EPTT      CA01      CA01               0                  4587
619       EPTT      CA02      CA02               0                  4587
620       EPTT      CA0205    CA02               2                  4587
621       EPTT      CA03      CA03               0                  4587
622       EPTT      CA04      CA04               0                  4587
623       EPTT      CA05      CA05               0                  4587
624       EPTT      1001      1001               0                  4587
625       EPTT      1002      1002               0                  4587
626       EPTT      1002XX    1002               2                  4587
627       EPTT      1005      1005               0                  4587
628       EPTT      RR01      RR01               0                  4587
629       EPTT      RR05      RR05               0                  4587
630       EPTT      RR05AD    RR05               0                  5500
631       EPTT      UT01      UT01               0                  4587
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634  EPTT    GS01     GS01     0                    4587
633  EPTT    GS02     GS02     0                    4587
634  EPTT    GS03     GS03     0                    4587
635  EPTT    GS04     GS04     0                    4587
636  EPTT    GS04I    GS04     1                    4587
637  EPTT    GS04S    GS04     1                    4587
638  EPTT    GS07     GS07     0                    4587
639  EPTT    GS07DP   GS07     2                    5789
640  EPTT    [illegible]  GS09     0                    4587
641  EPTT    GS10     GS10     0                    4587
642  EPTT    GS12     GS12     0                    4587
643  EPTT    GS12A    GS12     1
644  EPTT    GS12AA   GS12     2                    5014
645  EPTT    GS12D    GS12     1
646  EPTT    DMSCALC  GS11     3                    4587
647  EPTT    GS13     GS13     0                    6367
648  EPTT    UT01     UT01     0
649  EPTT    UT02     UT02     0
650  EPTT    UT03     UT03     0
651  EPTT    UT04     UT04     0

@PRT,S F3.USERSGS
FURPUR 27R2  RL72R1 10/04/76 12:00:23
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```
LEE*F3(1).USERSGS
        MSG  ON
        LIST       N,N,N,N,N,N
        SYS F1
        DMRMTS F2
        PCFF F3
        DMR F4
        REPF F5
        DMU  F6
        DDL F7
        DML  F8
        ADML F9
        CONTROLBANK  CONTRL,CONTRL  IV01,IV02,IV03,IV04,TH01,TH02,TH03,TH05,|    6A06
                  TH06,TH08,TH12,DC05,DH01,DH03,DH07,DH14,DH21,DH30,CA01,CA02,CA03,|  6B50
                     CA04,CA05,UT01,I001,I002,I005,RR01,GS01,GS02,GS03,|            6A06
                     GS04,GS07,GS09,GS10,GS12,UT02,UT03,UT04                        6A06
        BANK   BANK01,BANK01   IV05,IV06,IV07,IV08,IV09,TC01,TC04,TC06,|            6A06
                     TC09,TC13,TC14,TC15,TC16,TC17,TH09,TH14,DH16,DH17,DH20,DH23,|  6A06
                     DH24,DH46,RR05                                                 6A06
        BANK   BANK02,BANK02   DC21,DH09,DH08,DH10,DH11,DH12,DH13,DH18,DH19,|       6A06
                     DH26,DH27,DH28,DH29,DH31,DH35,DH36,DH37,DH43,DH47,DH50,DH51,|  6A06
                     DH52,GS11,GS13                                                 6A06
        BANK   BANK03,BANK03   DC02,DC0301,DC0302,DC0303,DC0305,|                   6A06
                     DC0306,DC0307,DC07,DC08,DC11,DC12,DC14,TH04,TH15,TH17,|        6A06
                     TH20,DH05,DH04,DH22,DH25,DH34,DH38,DH39,DH40,|                 6A06
                     DH42,DH44,DH45                                                 6B50
        DMRBUF   DMRBUF,DMRBUF                                                      6A06
        SWITCHES   RVACTS    0             1                                        6A06
        SWITCHES   REPON     1             0
        SWITCHES   TIMRON    1             0
        SWITCHES   SFASGK    1             0
        SWITCHES   ATASGK    1             0
        SWITCHES   ATT       1             0
        OVERLAY    1   DH12, DH13, DH31, DH50, DH51
        OVERLAY    2   DH09, DH36, GS11, GS13
        OVERLAY    3   TC06, TC16, TC17, DC14, RR05
        OVERLAY    4   DH43
        OVERLAY    5   DC0301, DC0302, DC0303, DC05, DH07, DH30, DH34
        OVERLAY    6   DH05, DH10, DH18, DH37
        OVERLAY    7   TC04, TC13, TH14, DH52
        OVERLAY    8   TC01, DH16, DH17, DH20, DH24
        OVERLAY    9   TC09, DH23
        OVERLAY    10  TC14, TC15, TH09
        OVERLAY    11  DH42, DH46
        OVERLAY    12  DC02, DC11, DH04
        OVERLAY    13  DC08, DC12, DH08
        OVERLAY    14  DC21, DH11, DH44, DH45
        OVERLAY    15  DC07, DH25, DH40
        OVERLAY    16  DC0305, DC0306, DC0307, DH19, DH35, DH47
        OVERLAY    17  TH20, DH38, DH39
        OVERLAY    18  DH26, DH27, DH28, DH29
        SGS
        MAINSEG 0 IV00,IV01,IV02,IV03,IV04,IV05,IV06,IV07,IV08,IV09,|
         TH01,TH02,TH03,TH04,TH05,TH06,TH08,TH12,TH15,TH17, |
         DH01,DH03,DH14,DH21,DH22, |
         CA01,CA02,CA03,CA04,CA05, |
         UT01,UT02,UT03,UT04,I001,I002,I005, |
         RR01, |
         GS01,GS02,GS03,GS04,GS07,GS09,GS10,GS12
        SEG          1              2,4,11,17
        SEG          2              1,3,4,10,16
        SEG          3              6,7,16,17
        SEG          4              5,8,14,15
        SEG          5              6,13,15,18
        SEG          6              12,14,14,18

@PRT,S F4.DMSSGP/BASE
FURPUR 27R2  RL72R1 10/04/76 12:00:50
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LEE*F4(1).DMSSGP/BASE
                 DEF
.                *****                                                *****    5619
.                *****                                                *****    5619
.                *****    DMS-1100  SYSTEM GENERATION  PARAMETERS     *****    5619
.                *****                                                *****    5619
.                *****                                                *****    5619
.                USE THE FOLLOWING LABELS FOR TURNING SWITCH PARAMETERS        5619
                 ON OR OFF.                                                    5619
ON               EQU       1                  . THE SWITCH IS ON ( SET 1).     5619
OFF              EQU       0                  . THE SWITCH IS OFF( NOT SET).   5619
.                *****   WARNING     *****    WARNING   *****                  5619
.                DO NOT ALTER DEPENDENT PARAMETER SWITCHES!                    5619
.                 A DEPENDENT PARAMETER SWITCH IS EITHER                       5619
.                 1.  B    EQU   A .  ( A NOT THE LABEL ON OR OFF .)           5619
.                     B IS THE SAME AS A.  A CHANGE TO A WILL CHANGE B.        5619
.                 2.  B    EQU  ON--A.                                         5619
.                     B IS THE OPPOSITE SWITCH SETTING FROM A.                 5619
.                     AGAIN, A CHANGE TO A WILL CHANGE B.                      5619
.                 3.  B    EQU  AA++AB.                                        5619
.                     B IS ON IF EITHER AA OR AB IS ON.  A CHANGE TO AA        5619
.                     AND/OR AB WILL CHANGE B                                  5619
.                *****                                                *****    5619
.                ***** DMR CODE GENERATION SWITCH PARAMETERS *****             5619
.                *****                                                *****    5619
.                THESE SWITCHES AFFECT THE OPERATION OF THE DMR ( AND OTHER    5619
.                DMS ROUTINES)  BY CAUSING CONDITIONAL CODE GENERATION.        5619
.                    SWITCH SETTING AFFECT THE AMOUNT OF CODE GENERATED IN THE DMR 5619
.                *****                                                *****    5619
CDB              EQU       ON.        IF ON  AND REPON IS ON,DMR IS COMMON BANK 5619
REPON            EQU       OFF.        IF OFF, THE DMR MUST BE MAPPED INTO     5619
.                                      USERS BANK.                             5619
.                                      IF ON  AND CDB IS  OFF, THE DMR IS A REP. 5619
TIMRON           EQU       OFF.       TIMER IS NEEDED IF REPOM OR ATT IS ON    5619
CDBAPT           EQU       ON.         SET IF COMMON BANK DMR WILL PROCESS ALL 5619
.                                      ABNORMAL CONTINGENCIES. REQUIRES LEVEL 32 E8 5619
CDBON            EQU       CDB**REPON       .  COMMON BANK DMR INDICATOR       5619
CDBCON           EQU       CDBAPT**CDBON    .  COMMON BANK CONTINGENCY INDICATOR 5619
.           ************ NOTE CDBMB IS SET BY SYSTEM GENERATION ************   5562
CDBMB            EQU       OFF              .   SWITCH TO CONTROL MULTIBANKING 5562
                                            .   = 0 , NO BANKING               5562
                                            .   =1 , ASM OPTION! PDP TABLES    5562
                                            .   =2 , EXECUTION! ASM TABLES     5562
.   ****         DMS FEATURE SWITCHES    ****                                  5619
.                *****                                                *****    5619
CALC             EQU       ON.         IF ON, THE CODE FOR STORE CALC SHOULD BE 5619
.                                      INCLUDED IN DMR.                        5619
DIRECT           EQU       ON.         IF ON, THE CODE FOR STORE DIRECT SHOULD BE 5619
.                                      SHOULD BE INCLUDED IN DMR.              5619
ERRDMP           EQU       ON  .       SET IF DUMPING OF SPECIFIED ERROR CODES 5619
.                                      IS TO OCCUR IN IVO3.                    5619
.                                      INCLUDED IN DMR.                        5619
GENCOM           EQU       ON.         SET IF CODE FOR GENERALIZED COMMANDS    5619
INDSEQ           EQU       ON.         IF ON, THE CODE FOR INDEX SEQUENTIAL    5619
.                                      LOCATION MODE SHOULD BE INCLUDED IN DMR. 5619
PASETS           EQU       ON.         IF ON, THE CODE FOR POINTER ARRAYS SET  5619
.                                      MODE SHOULD BE INCLUDED IN DMR.         5619
VIASET           EQU       ON.         IF ON, THE CODE FOR STORE VIA SET SHOULD BE 5619
.                                      INCLUDED IN THE DMR.                    5619
RANDEN           EQU       ON.         IF ON, THE CODE FOR CALC RANDENTIAL SHOULD 5367
.                                      BE INCLUDED IN THE DMR                  5367
SPA              EQU       ON.  IF ON,THE CODE FOR SORTED POINTER ARRAY SET MODE 5619
.                              SHOULD BE INCLUDED IN THE DMR.                  5619
SPA1             EQU       SPA**PASETS. CONDITIONAL SWITCH FOR CODE SHARED BY  5619
.                                       SORTED POINTER ARRAY AND POINTER ARRAY 5619
INDSPA           EQU       SPA**INDSEQ. CONDITIONAL SWITCH FOR CODE SHARED BY  5619
.                                       SORTED POINTER ARRAY AND INDEX SEQUENTIAL 5619
DDECTT           EQU       ON            .  IF SET, NEW DEADLOCK DETECTION CODE USED 5989
DDRSOL           EQU       ON          . IF SET, NEW DEADLOCK RESOLUTION CODE USED 5989
.                                            IF USED DDECTT MUST ALSO BE ON    5989
DDTTRS           EQU       DDECTT*DDRSOL . IF SET, NEW DEADLOCK RESOLUTION USED 5989
FORTRN           EQU       ON                 . 1 FOR FTN TO COB OR COB TO FTN 5A33
.                                             . CONVERSIONS ELSE 0             5A33
.   *** END OF DMS FEATURE SWITCHES    ****                                    5619
.         *****                                                       *****    5619
.         *****                                                       *****    5619
.   ****  RECOVERY  SWITCHES  ****                                             5619
AUTORP           EQU       OFF.        IF ON, AUTO RECY POINTS MAY BE  TAKEN   5619
.                                      TO AUDIT TRAIL TAPE.                    5619
```

```
ATT       EQU       OFF.      IF OFF, NO AUDIT TRAIL TAPE IS ASSIGNED        5619
.                             IF ON,  AUDIT TRAIL TAPE(S) IS ASSIGNED        5619
.                             TO TIMER.                                      5619
.  TIMRON  MUST BE ON TO USE  AUDIT TRAIL TAPE.                              5619
.   ATT  ON  ALSO CAUSES DATA  LOCATIONS TO BE FORMED IN DATA BUFFER-IVOO    5619
.                                                                            5619
CKPT6     EQU       ON             .    SET IF NEW CKPT DESIRED              5739
QLF       EQU       ON.       IF ON, QUICK-LOOK FILES ARE PRESENT.           5619
.                             IF OFF,QUICK-LOOK FILES ARE NOT USED.          5619
.    ****  END OF RECOVERY SWITCHES  ****                                    5619
.         *****                                             *****            5619
.         *****                                             *****            5619
.  ****  DATA BASE USAGE SWITCHES (THIS INCLUDES DATA BUFFER)  ****          5619
COFPL     EQU       OFF.      FLAG FOR SPECIAL PLACEMENT OF RECORDS          5619
.                             OWNED BY CALC RECORDS.                         5619
.                             IF SET, THE ORIGINAL DBK OF CALC RECORDS       5619
.                             WHICH ARE PLACED ON OVERFLOW IS SAVED AND      5619
.                             USED AS THE PRIOR POINTER FOR MEMBER           5619
.                             RECORDS STORED VIA SET.                        5619
DTCHAIN   EQU       OFF.      IF SET, WHEN RDT/SDT ARE REQUESTED AND         5619
.                             THEY ARE ALREADY IN CORE, A CALL TO CORE       5619
.                             ALLOCATION IS NEED TO RE-ESTABLISH IT IN       5619
.                             'MOST RECENTLY REFERENCED DT' CHAIN.           5619
.                             IF OFF, IT IS EXPECTED THAT ALL DT'S CAN       5619
.                             FIT IN THE TABLE BUFFER AREA AT ONE TIME       5619
.                             (CHAIN THEN MEANINGLESS).                      5619
LDPAGE    EQU       ON.       IF ON, LAST DATA PAGE IS USED.                 5619
.                             IF OFF, LAST DATA PAGE IS NOT USED.            5619
ONESCH    EQU       ON.       IF ON, ONLY ONE SCHEMA IS USED. THE DMR        5619
.                             WILL NOT INCREMENT THE REFERENCE TABLES        5619
.                             WHEN DOING SECONDARY IMPARTS.  THEY ARE NOT    5619
.                             RELEASED EVEN WHEN NO RUN UNITS ARE ACTIVE.    5619
.                             THE REFERENCE TABLES ARE NOT REBUILT.          5619
SDP       EQU       OFF.      IF ON, SEARCH DATA PAGES FOR OVERFLOW SPACE    5619
.                             AFTER SPACED AND GLOBAL OVERFLOW.              5619
.    ****  END OF DATA BASE USAGE SWITCHES  ****                             5619
.         *****                                             *****            5619
.         *****                                             *****            5619
.   ****  DMR OPERATION SWITCHES  ****                                       5619
QDLR      EQU       OFF.      QUEUE DEADLOCK RESOLUTION                      5619
.                             IF ON, THE USER SPECIFIED PRIORITY (TRUOS1)    5619
.                             IS USED TO DETERMINE WHICH RUN UNIT IS TO      5619
.                             BE ACTIVED TO BE ROLLED BACK.                  5619
.                             IF OFF, THE NUMBER OF DATA BASE UPDATES        5619
.                             (TRUOSO) IS USED.
.                             (TRUOSO) IS USED.                              5619
.    **** THE FOLLOWING SWITCHES HAVE MEANING IF TIMRON IS ON ****           5619
KDMR      EQU       OFF.      IF SET, THE DMR IS REQUIRED TO STAY IN         5619
.                             CORE, EVEN IF NO RUN UNIT IS ACTIVE IN DMR.    5619
SFASGK    EQU       OFF.      IF ON, SYSTEMS FILE IS ASSIGNED BY TIMER       5619
.                             (@ASG,A).                                      5619
.                             IF OFF, THE USER MUST DO AN @ASG,T OF          5619
.                             SYSTEMS FILE.                                  5619
.   IN EITHER CASE A SYSTEMS FILE MUST BE IN EXISTANCE AND INITIALIZED)      5619
.    **** THE FOLLOWING SWITCHES HAVE MEANING IF ATT IS ALSO ON  ****        5619
COMPAL    EQU       OFF.      SET IF COMPACTED AFTER/LOOKS DESIRED           5777
ATASGK    EQU       OFF.      IF SET, AUDIT TAPE IS ASSIGNED BY TIMER        5619
.                             AND UNITS REQUESTED BY TIMER.                  5619
ATTUS1    EQU       ON  .   IF ON, ONE AUDIT TAPE UNIT IS ASSAIGNED          5619
.                             IF OFF, TWO AUDIT TAPE UNITS ARE ASSIGNED.     5619
ATTUS2    EQU       ON--ATTUS1.   TWO AUDIT TAPE UNIT SWITCH.                5619
U20GW     EQU       OFF.      IF ON , THE MACHINE IS 1106 OR 1108 AND        5619
.                             AUDIT TAPE IS U20,                             5619
.    ****   END OF TIMER SWITCHES  ****                                      5619
SEG       EQU       OFF.      SET IF SEGMENTED DMR IS WANTED.                5619
NOSEG     EQU       ON--SEG.                                                 5619
STAT      EQU       ON  .     SET IF STATISTICS CODE IS WANTED.              5619
NOSTAT    EQU       ON--STAT.                                                5619
TIP       EQU       OFF.      SET IF TIP I/O IS TO BE USED IN DMR.           5619
.     TIP  ON  ALSO CAUSES DATA LOCATIONS TO BE FORMED IN DATA BUFFER-IVOO.  5619
EXEC8     EQU       ON--TIP.                                                 5619
.    **** END OF DMR CODE GENERATION SWITCHES     ****                       5619
.         *****                                             *****            5619
.         *****                                             *****            5619
.         *****    DMR DATA BUFFER PARAMETERS        *****                   5619
.         *****                                             *****            5619
.         THESE PARAMETERS DEFINE THE SIZES OF VARIOUS TABLES AND            5619
.         BUFFERS IN THE DMR DATA BUFFER- IVOO ( AND OTHER DMS ROUTINES ).   5619
.         A CHANGE TO A PARAMETER IN THIS SECTION WILL AFFECT THE SIZE       5619
.            OF IVOO.  ( NOTE: THE SWITCH PARAMETERS - ATT, QLF, TIMRON,SEG,     5619
.                        TIP, AND STAT - ALSO AFFECT THE SIZE OF IVOO. )            5619
BUFSZR      EQU       1898.        BUFFER SIZE FOR AUDIT TRAIL I/O                   5619
IRINUM      EQU       10.          MAX. NUMBER OF RECORDS WITH INTERVAL              5619
.                                  CLAUSE. SHOULD NEVER BE NON-ZERO!                 5619
NUMBIL      EQU       10.          MAX. NUMBER OF AREAS WITHOUT PRE-                 5619
.                                  INITIALIZED PAGES THAT CAN BE                     5619
.                                  SIMULTANEOUSLY OPENED FOR INITIAL LOAD.           5619
.      IF 9-TRACK TAPES ARE USED FOR AUDIT, NUMBIL MUST BE AN EVEN NUMBER.          5619
NUMBRU      EQU       [illegible]  MAXIMUM NUMBER OF RUN UNITS                       5619
SCLLEN      EQU       1.           LENGTH OF SCHEMA REFERENCE TABLE LIST             5619
SSLLEN      EQU       1.           LENGTH OF SUBSCHEMA REF. TABLE LIST               5619
ARLLEN      EQU       64.          LENGTH OF AREA REF. TABLE LIST                    5619
RRLLEN      EQU       64.          LENGTH OF RECORD REF. TABLE LIST                  5619
SRLLEN      EQU       150.         LENGTH OF SET REF. TABLE LIST                     5619
BUTLEN      EQU       150.         MAX. NUMBER OF PAGE ENTRIES FOR BUT               5619
TABLEN      EQU       2000.        LENGTH OF DYNAMIC DMR TABLE BUFFER AREA           5619
PAGLEN      EQU       7500.        LENGTH OF DYNAMIC DMR PAGE BUFFER AREA            5619
TIPLEN      EQU       2000.        LENGTH OF DYNAMIC DMR TIP PAGE BUFFER AREA        5619
.          THE TIP PAGE BUFFER IS ALLOCATED WHEN TIP IS ON.                          5619
QLSIZE      EQU       1898.        SIZE OF ROLLBACK BUFFER                           5619
DWNMAX      EQU       15.          MAXIMUM NUMBER OF AREAS THAT CAN BE               5619
.                                  'DOWNED' SIMULTANOUSLY.                           5619
.            DWNMAX MUST BE A MULTIPLE OF 3.                                         5619
.       ****  THE FOLLOWING VALUES HAVE MEANING IF QLF IS ON.  *****                 5619
.       THESE VALUES ARE USED BY THE DMR AND OTHER DMS ROUTINES WHEN                 5619
.       QUICK LOOK FILES ARE USED.  THE PROC DMSSGP GENERATES THE QUICK              5619
.       LOOK DATA TABLES IN IVOO. THESE VALUES MUST BE CONSISTENT WITH               5619
.       THE PROC SKELETON.  (QLINIT VALIDATES THE GENERATED TABLES. )                5619
NUMSEG      EQU           10.      NUMBER OF QUICK LOOK FILE SEGMENTS (E8 I/O)       5619
NUMFLN      EQU           2.       NUMBER OF QUICK LOOK FILES  (E8 I/O)              5619
TNUMSG      EQU           10.      NUM OF QL FILE SEGMENTS (TIP I/O) TIP ON          5619
TNMFLN      EQU           2.       NUM OF QL TIP FILES - TIP ON                      5619
.      ****  END OF DMR DATA BUFFER PARAMETERS   *****                               5619
.            *****                                                                   5619
.            *****                                                    *****          5619
.            *****   DMS SYSTEMS CONSTANTS   *****                    *****          5619
.            *****                                                                   5619
.            THESE PARAMETERS ARE A COLLECTION OF VALUES NEEDED FOR   *****          5619
.            THE OPERATION OF DMS 1100.                                              5619
.      ****    DMR COMMON BANK CONSTANTS   ****                                      5619
.                                                                                    5619
.
.      ****    END OF DMR COMMON BANK CONSTANTS  ****                                5619
MAXREC      EQU         1000.      MAX NUM OF MEMBER RECORDS IN SET OCCURENCE        5619
PRTEJT      EQU         57.        NUMBER OF PRINTABLE LINES PER PAGE                5619
.                                  FOR USE BY SET CALC VERIFY TO EJECT TO            5619
.                                  NEXT PAGE ON STATUS ONLY OPTION                   5619
DBNKST      EQU         0159000          . START OF DBANK IF REP OR CB              5619
DBUFST      EQU         0200000      .      START OF MULTIBANKED BUFFER              5562
MAXRUT      EQU         175.       MAX NUM OF TIME UNITS A RUN UNIT CAN BE           5619
.                                  IN THE DMR                                        5619
TIME        EQU         2000.      TIME UNIT VALUE IN MILLI-SECONDS                  5619
.                                  TIMER WILL TWAIT A TIME UNIT.                     5619
.            RUN UNIT TIME OUT VALUE IN DMR  IS  MAXRUT*TIME  (IN MILLI-SECS).      5619
TIPSEGNUM EQU           033.       TIP FILE NUMBER  IF TIP FILE IS USED FOR          5619
.                                  SEGMENTED DMR.  (TIPRUN IS ON. )                  5619
.      ****    END OF DMS SYSTEM CONSTANTS  ****                                     5619
.            *****                                                    *****          5619
.            *****                                                    *****          5619
.            *****                                                    *****          5619
.            *****     SOFTWARE DEVELOPMENT SWITCH PARAMETERS   *****                5619
.            *****                                                    *****          5619
.            THESE SWITCHES SHOULD NOT BE ALTERED BY THE SITE UNLESS                 5619
.            ALSOLUTELY NECESSARY.  A SITE ALTERATION COULD PRODUCE A                5619
.            NON SUPPORTED VERSION OF THE DMR.                                       5619
RUACTS      EQU        ON.         IF OFF, ALL RUN UNITS ARE SEPARATE PROGRAMS.      5619
.                                  IF ON, SOME RU'S MAY BE ACTIVIES.                 5619
RLIST       EQU        OFF.        IF ON ( AND DMR IS REP), THE REP IS RLISTED.      5619
TSQON       EQU        ON.         IF ON, TSET QUEUING IS USED.                      5619
ACTON       EQU        ON--TSQON.  IF ON, ACT/DACT IS REQUIRED.                      5619
NUMPKT      EQU        NUMBRU.                                                       5619
TIPRUN      EQU        ON.         IF SET, BOTH TIP & EXEC8 FILE CONTROL IS          5619
.                                  USED FOR I/O.                                     5619
E8TST       EQU        ON--TIPRUN.     IF SET, TEST TIP & EXEC8 USING ONLY           5619
.                                      EXEC8  FILE CONTROL.                          5619
MNAREA      EQU        ARLLEN-2.     MAX NUMBER OF AREAS.                            5619
FLAPSW      EQU        OFF.        IF ON, FLAP MECHANISM IS TURNED ON.               5619
SNOP        EQU        OFF                                                           5619
```

```
DATCON     EQU       FORTRN             . DATA CONVERSION FLAG                  5A33
.     ****  END OF SOFTWARE DEVELOPMENT SWITCH PARAMETERS   ****                5619
.           *****                                                 *****         5619
.           *****                                                 *****         5619
.           *****                                                 *****         5619
.           THERE ARE 4 POSSIBLE INPUT PARAMETERS FOR THE DMSSGP PROC           5892
.                     IF NOT SET THE INFORMATION IS SET UP UNDER LOCATION       5892
.                     COUNTER 2                                                 5892
.          THE SECOND IF SET ACCESSES NAMES AND QUALIFIERS FOR THE DMR          5892
.          THE THIRD IF SET ACCESSES AUDIT TRAIL INFORMATION                    5892
DMSSGP*    PROC
 DO DMSSGP(1)=0 , END                                                           5A44
  DO CDBMB>0 ,$(2) ,                                                            5562
  DO CDBMB>0 , GO P1                .                                           5562
 DO DMSSGP(1,1)=1 ,$(1)
 DO DMSSGP(1,1)=0 ,$(2)
 DO DMSSGP(1,2)=0 , GO ATTLAB                                                   5838
P1         NAME          .                    5562
 DO DMSSGP(1)<4 , END                                                           5A44
           ON        CDBMB*+CDBON    .                                          5562
CDBNAM**   +         DMRS            .        NAME OF DMR CDB                   5409
           ON        CDBMB           .                                          5562
BUFNAM**   +         DMRBUF          .                                          5562
           OFF       CDBMB           .                                          5562
           OFF       CDBMB*+CDBON    .                                          5562
ACCNT**,                                                                        1030
           +         '       491110' .        REAL TIME ACCOUNT NUMBER          4568
TIMRID**,                                                                       3026
           +         'TIMER '        .        TIMER'S RUN ID                    3026
DMRLEV**   +         'LEV6.0'        .        LEVEL OF DMR                      5464
REPNAM**   +         'DMR    '
DMSQUAL**,                                                                      5377
           +         '          DMS'  .                                         5377
SYSFN**    'DMS-SYS-FILE'
DYNDUMPID** + 'DYNDUM' .                      DYNAMIC DUMP RUN ID               5425
ATTLAB     NAME          .                                                      5838
 DO DMSSGP(1,3)=0 ,  GO NOTDMR
 DO ATT=0 ,  GO NOTDMR
.  IF ATT = 1, THE FOLLOWING MUST BE SPECIFIED                                  R035
ATTFNT*    EQU       'AUDIT-TRAIL1'.                                            3205
ATTFN**    +         ATTFNT          .        FILE NAME OF AUDIT TRAIL TAPE     3205
.                                                                               R069
SUBSNO**,                                                                       R069
           ' S20/ U0/ U1'.
           ' S10/ U60000'.                    IF ATTUS1 = 1
.                                             THIS ENTRY MUST BE TWO WORDS LONG.
.                                             EACH FIELD IS RIGHT JUSTIFIED,
.                                             SPACE FILLED. THE SUBSYSTEM AND UNIT
.                                             NUMBER(S) ARE IN DECIMAL. THE
.                                             DELIMITERS MUST BE PRESENT
.
NOTDMR*    NAME.
 DO DMSSGP(1,2)=0 ; END
 DO DMSSGP(1,4)=0 ; END                                                         5838
ESEGNAM**  +         'SEGMENT-FILE' .   NAME OF THE EXEC8 SEGMENT-FILE          5174
 DO QLF=0  , END
QLSEGT**   +         0057,0,0
           +         0,0,0,0,0,NUMSEG-1
QLSADD**   +         0101,0
           +         1280,0
           +         0201,0
           +         1280,1280
           +         0301,0
           +         1280,2560
           +         0401,0
           +         1280,3840
           +         0501,0
           +         1280,5120
QLSACQ**   +         0602,0
           +         2560,0
           +         0702,0
           +         2560,2560
           +         01002,0
           +         2560,5120
           +         01102,0
           +         2560,7680
           +         01202,0
           +         2560,10240      .                                          3204
QLSEGN**   'QUICK-LOOK1'
```

```
316               'QUICK-LOOK2'
317     QLFASG**,
318               +           0057,0,0      .   TS FOR QLF BIT MAP              5377
319      DO NUMFLN ,      +     0.                                              5981
320                           TIP     . 1 IF TIP FILE CONTROL USED FOR QL I/O   5377
321     TQLSGT**  +           0057,0,0.                                         3269
322               +           0,0,0,0,0,THUMSG-1.                               3269
323     TQLSAD**  +           0101,0.                                           3269
324               +           1280,0.                                           3269
325               +           0201,0.                                           3269
326               +           1280,1280.                                        3269
327               +           0301,0.                                           3269
328               +           1280,2560.                                        3269
329               +           0401,0.                                           3269
330               +           1280,3840.                                        3269
331               +           0501,0.                                           3269
332               +           1280,5120.                                        3269
333     TQLACQ**  +           0602,0.                                           3269
334               +           2560,0.                                           3269
335               +           0702,0.                                           3269
336               +           2560,2560                                         3269
337               +           01002,0.                                          3269
338               +           2560,5120.                                        3269
339               +           01102,0.                                          3269
340               +           2560,7680.                                        3269
341               +           01202,0.                                          3269
342               +           2560,10240.                                       3269
343     TQLSGN**  +           030.                                              3269
344               +           0.                                                3269
345               +           031.                                              3269
346               +           0.                                                3269
347               OFF         TIP     . 1 IF TIP FILE CONTROL USED FOR QL I/O   3269
348               END

@BRKPT PRINTS
```

IV. 1.2. Building a DMS System

1.2.1. General

At the time the Data Administrator decides to bring up a new DMS system, he very likely will tailor this system to his local processing needs. Chronologically this involves a five step process:

a) select desired DMS features

b) choose size of variable length buffers

c) choose operating configuration

d) generate the DMS system

e) register the multithread DMR with the operating system

Once the Data Administrator has performed steps a, b and c to suit his application he is ready to generate a DMS system to reflect these decisions. The remainder of this section discusses how to do this.

1.2.2. DMS System Generation

1.2.2.1. General

DMS system generation consists of assembling and collecting one or more of the processors or utility programs used with DMS 1100. The Data Administrator may desire to generate a new DMS system to:

- Change the structural configuration of the DMR (e.g., REP or CB, segmented or not, with or without an audit trail)

- eleminate code not used at a particular site (e.g., index sequential or pointer array code)

- tune the code for particular applications (e.g., one schema or several, space for page buffer)

- apply code corrections (e.g., add corrections as they are made available)

The DMS 1100 system as sent to the site consists of a multifile tape. The exact format of this tape is described in the system release bulletin. Included on the release tape is a program to generate new versions of DMS. This program, DMSUP, uses the Symbolic Stream Generator (SSG). A run stream to be used with DMSUP is described in this section. The output of one systems generation is formatted to be used as input to the next generation. It is expected that DMSUP will be used for all DMS coding changes. The Data Administrator provides input to DMSUP in two forms:

- temporary correction file (TCF)
- stream generation statements (SGS)

The SGS statements generally specify options which apply to the generation process itself. These are explained in detail below.

The TCF will become a part of the generated output in a two stage process. In step one, the TCF is merged with an existing set of corrections called the permanent correction file (PCF). This is the set of all coding changes made since a base period. The PCF then is merged aganist the base symbolics, assembled and collected. The resultant relocatable and absolute elements constitute the output of the generation.

Each symbolic element of the DMS system has associated with it a correction element. All input to the generation process other than SGS statements is done by adding or changing lines of code in the correction element. A change is initiated by three essential ingredients:

- the name of the correction element proceeded by an asterisk (e.g., *DH30C for a change to DH30, *SGPC for a change to DMSSGP)
- the line number of the line to be changed in the base or PCF
  (e.g., -105, 106 to replace lines 105 and 106)

- o the new code to be added, if any

  (e.g., L,U A3, 017)

All such changes are placed in an element, TCF.TCF, expected by the skeleton. Then DMSUP can be @ADD'ed.

In particular, switches are set to indicate desired features and variable length buffers are sized by setting values in the DMS System Generation Parameter element, DMSSGP. The correction element for this routine is SGPC. The individual components of DMSSGP, and their default values, are discussed in the next section.

1.2.2.2. System Generation Parameters

When any DMSSGP parameters are changed, all elements calling DMSSGP must be reassembled - this includes the DMR, LINKER, TIMER, LONG RECOVERY, DMRACT, DTBSDMP1, DTBSDMP2, SFINIT, QLINIT, and QUIREC. This is controlled and automatically performed when an @ADD of DMSUP is performed. Parameters in DMSSGP are used in conditional generation of code using the ON-OFF assembler directives and also are used in establishing parameters used by the above elements which are common to more than one element i.e. quick look file and audit trail tape information.

V. 1.2.2.2.1. DMSSGP Individual Parameters

The system generation parameters are defined in the PDP element DMSSGP, in the DMR file of each release tape. (See the Tape File Description which accompanies each release tape.)

Parameters in DMSSGP which are not described below are intended for internal use by Univac's Roseville Development Center, and should not be altered by the user. The standard parameters and their values are defined below. New parameters have asterisks. The switch is on (set) when it has the value 1. It is off (not set) when it has the value 0.

Label	Definition and Standard Values +
MAXREC	Maximum number of member records in a set occurrence. Used by SET and CALC VERIFY to detect a loop condition (i.e. bad set or calc pointers.) MAXREC = 1000
AUTORP	If off, no automatic recovery points are taken. If on, automatic recovery points are placed on the audit trail tape based on the RECOVERY POINTS clause in the Schema definition. ATT must be set to 1. AUTORP = 0

BUFSZR	Size of buffer used by LONGRECOVERY or SELECTIVE Recovery when reading the audit trail tape. This buffer must be larger than the biggest block on the audit trail i.e. maximum page size plus six words (block leader) or size of largest log block, whichever is the greatest. BUFSZR = 1848 words). Note: If Long Recovery of Pointer Array Initial Load is required, the value of BUFSZR should be calculated as described in Section 6 of the release bulletin.

+ All values are expressed as decimal numbers except where leading zeros are present in which case they are octal numbers.

Label	Definition and Standard Values +
REPON	This parameter, if off indicates that the DMR is collected with the run unit. If on, it indicates that the DMR is being used in multithread mode: as a REP, CDB, or multiple CB.
TIMRON	If TIMRON is off, the TIMER and its functions cannot be used. If set to 1,

	the TIMER and its functions can be used, as specified by relevant parameters e.g. audit trail. (If REPON is on, TIMRON must also be on.)
DBNKST	Start of D-Bank when DMR is a REP or CB. This value is used in the LINKER to establish the base address of the D-Bank. The Linker should be the first element in the D-Bank, i.e., it should be INned first and all other elements should also be INned. DBNKST = 0154000 (octal).
SFASGK	Set to on if it is required that the TIMER routine in DMR (IV02) assign the System File dynamically.
ATASGK	Set on if it is required that the TIMER routine in DMR (IV02) assign the Audit Trail Tape dynamically.
ATTUS1	If set to 1, only one tape unit is used for the Audit Trail. ATTUS1 = 1.

	If set to 0, two units are used for the Audit Trail (See parameter SUBSNO for details on Subsystem/Units specification).
LRINUM	The maximum number of records in the schema having an interval clause. LRINUM = 10
NUMBIL	Maximum number of areas without preinitialized pages that can be simultaneously opened for initial load. NUMBIL - 10
LDPAGE	Set on if the last page number where space was found is to be used as the base point to search for space. LDPAGE = 1
COFPL	If set, a special placement consideration may be invoked for records whose location mode is via set. If the prior pointer for the record is a calc record on an overflow page, the original calc'ed DBK is used as the prior pointer, not the overflow page.

	Record placement of the object record is then determined as usual: based on this prior pointer (logical insert point) and subject to the normal rules of placement (within, interval clauses, LDPAGE value, space on pages). In order for this special placement to be used, a current restriction is that the area-name item for the prior pointer calc record be initialized to the area name in which the prior record is stored. COFPL = 0
NUMBRU	The maximum number of run units that can use the DMR concurrently. NUMBRU = 5
SCLLEN	The length of the schema reference table i.e. the number of schemas that can be 'invoked' in the DMR. SCLLEN = 1
ONESCH	Set to 1 if only one schema is used. This switch causes the area/record/ set reference tables not to be released even if the number of run units in the

	DMR goes down to zero. If SCLLEN is greater than 1, this switch must be set to zero. ONESCH = 1.
ARLLEN	The length of the area reference table list. This list consists of a two-word header and one-word entry for each area. Note that this parameter controls the maximum number of areas allowed. ARRLEN = 64.
RRLLEN	The length of the record reference table list. This list consists of two-word header and one-word entry for each record tape. This parameter controls the maximum number of record of records types allowed. RRLLEN = 64.
SRLLEN	The length of the set reference table list. This list consists of a two-word header and one-word entry for each record type. This parameter limits the number of sets allowed. SRLLEN = 150.

BUTLEN	The length of the block usage table. This parameter controls the number of pages which may be in core simultaneously assuming space exists in the buffer area. BUTLEN = 150. The database administrator must determine the value for this parameter in conjunction with the determination of PAGLEN. $\text{BUTLEN} = \frac{\text{PAGLEN (+ TILPEN)}}{\text{smallest page size}}$ (the result must be greater than or equal to NUMBRU X 2)
TABLEN	The length of the dynamic table area in UBA. TABLEN = 2000.
PAGLEN	The length of the page area in the UBA. PAGLEN = 7500.
TIPLEN	The length of the TIP page area in the UBA. The TIP page area is allocated only if TIP = 1. TIPLEN = 2000.
MAXRUT	The maximum time a RU can be in the DMR, is computed by multiplying this parameter by 'TIME'. MAXRUT = 175.

TIME	Number of milliseconds the Timer will TWAIT. TIME = 2000. (two seconds).
QDLR	For queueing/deadlock resultion, If = 0 the number of altered pages is used to determine which run unit is to be activated or rolled back. If = 1 the user PRIORITY scheme is used to determine which run unit is to be activated or rolled back. QDLR = 0.
ATT	Set to 1 if an audit trail tape is present. Code in DMR dealing with the audit trail is conditionally generated based on this parameter. ATT = 1.
DWXMAX	Maximum number of areas that can be 'downed' simultaneously. DWXMAX = 15.
QLF	See section IV.1.2.2.3 for a detailed explanation of the associated parameters and tables that have to be specified. QLF = 1.

TIP	Set to 1 if TIP file control is going to be used for TIP files. TIP = 0.
KDMR	Set to 1 if the DMR is to be kept in core (i.e. the TIMER program remains linked to the DMR) even if there are no run units active. KDMR = 0.
DIRECT	Set to 1 if DMR code for STORE DIRECT should be included. DIRECT = 1.
CALC	Set to 1 if DMR code for STORE CALC should be included. CALC = 1.
VIASET	Set to 1 if DMR code for STORE VIA SET should be included. VIASET = 1.
PASETS	Set to 1 if code in the DMR for Pointer Array set mode handling should be included. PASETS = 1.
INDSEQ	Set to 1 if code in the DMR for Index Sequential location mode handling should be included. INDSEQ = 1.
GENCOM	Set to 1 if code in the DMR for handling Generalized Commands should be included. GENCOM = 1.

ERRDMP	Set to 1 if a dump of the DMR buffer is to be taken on specific error returns from DMR. ERRDMP = 0.
SDP	Set to 1 if it is required that the data pages following the original page CALC'ed to be searched for space when overflow is full. SDP = 0.
DTCHAIN	Set to 1 if Description Tables are required to be added to the 'least referenced chain' by the internal DMR core allocation mechanism. This parameter should be set to zero if all description tables can fit in the table region (TABLEN). DTCHAIN = 0.
SEG	Set to 1 if segmentation of DMR is required. See Attachment 1 of release bulletin for a detailed explanation of the procedures to be followed. SEG = 0.
STAT	Set to 1 if code in the DMR to collect statistics is required. STAT = 0.
ACCNT	Twelve character account number (leading spaces) used by the TIMER program

	so that it is allowed to raise itself to real-time status. ACCNT = 91192 (two words).
TIMRID	Six character run ID of the TIMER run (in @RUN card of symbolic element TIMLT) that is checked for validity on entry to the DMR. TIMRID = TIMER.
REPNAM	Six character name of the DMR REP. This is the name used to establish DMR as a standard REP in the EXEC element CONFIG by the use of the REPROG statement. REPNAM = 'DMR'.
SYSFN	The twelve character file name of the systems file SYSFN = DMS-SYS-FILE.
ATTENT	The twelve character file name of the audit trail tape. ATTENT = AUDIT-TRAIL 1.
SUBSNO	The subsystem and unit number(s) which must be reserved when using the audit trail, and which are used to perform are absolute assign of the file. Each

	field must have leading spaces and be of the format xxxx/xxx/xxx. If only one unit is required, i.e., ATUSS1 = 1, the last four characters must be binary zero. SUBSNO = 'S10/U6/U7'.
TIPSEGNUM	The TIP File Control Number of the TIP segment file. TIPSEGNUM = 033.
ESEGNAM	The twelve character EXEC file name of the segment file. ESEGNAM = SEGMENT-FILE.
CDB	This parameter, if set to 1, indicates that the DMR is being used as a Write Enabled Common Data Bank (CDB). CDB = ON.
CDBNAM	Six character name of the DMR Write Enabled Common Data Bank. This is the name used to establish DMR as a standard common bank in the EXEC element CONFIG by the use of the REPROG statement CDBNAME = DMR$.
CDBAPT	This parameter, if set, indicated that all abnormal program termination

	conditions will be captured by the DMR common data bank. May be used only with EXEC 32** or later. CDBAPT = OFF.
DMSQUAL	Twelve character name to be used as the DMS universal qualifier. This is the name used as the qualifier for all files dynamically assigned by the DMR. All files needed by the DMR and assigned by the run unit must have this qualifier. The name must be space filled, right justified. 'DMSQUAL = 'b̸ b̸ b̸ b̸ b̸ b̸ b̸ b̸ b̸ DMS'.
	** Level 32 Revision 1 Update A
*RANDEN	This switch is on if the code for the system calc routine RANDENTIAL is to be included in the DMR. RANDEN is on.
*SPA	This switch is on if the code for indexed pointer arrays is to be included. SPA is on.
*DDECTT	Set on if the (new) connection matrix logic is to be employed to detect deadlock. DDECTT is on.

*DDRSOL	Set on if the new deadlock resolution logic is to be employed. If DDRSOL is on, then DDECT must be on. DDRSOL is on.
*FORTRN	This switch must be on if the DMR is to be used by any FORTRAN run units. FORTRN is on.
*CKPT6	Set on if dynamic checkpoints are to be taken. If off, all checkpoints are taken when no run units are active. CKPT6 is on.
*COMPAL	Set on if after looks should include only records actually changed. If off, after looks include the entire page. COMPAL is on.
*U20GW	Set on if the audit trail is assigned to a Uniservo 20 tape unit and the DMR is executing on an 1106, 1108, or 1100/20. U20GW is off.
*DBUFST	Set to address at which the DMR system buffer is to begin. Applies when CDBMB is on only. DBUFST = 0200000.

*DYNDUMPID	Set to a 6 character name which must be used as the project-id of the run executing the utility DYNDUMP. DUNDUMPID = 'DUNDUM'.

The rollback/recovery tables and their associated system generation parameters will also be present. These are discussed in the following section, Rollback tables.

If a Data Administrator does not want to change any systems-generation values, he need only make the DMSSGP assembly PROC available whenever assembling the elements of the DMS system that use DMSSGP. If changes to standard constant values are desired, the Data Administrator must produce a new DMSSGP and maintain it in conjunction with the appropriate version of the DMS system. This is automatically controlled by DMSUP. It is strongly recommended that DMSUP be used for all system generations.

As noted above, the parameters ARRLEN, RRLLEN, and SRLLEN limit the total number of areas, record types and sets which may be defined in the database. Codes assigned to the areas may be any number between 1 and the maximum number specified by the AREA CONTROL clause.

For example, the DDL statement: AREA CONTROL IS 4000 AREAS will allocate a 12 bit field in the database-key to be used for the area-code. If ARLLEN is set to 64 areas, (the default value) then the database may contain at most 64 areas, each of which must be uniquely assigned a code between 1 and 4000. RRLLLEN and SRLLEN impose the same restrictions on records and sets respectively.

1.2.2.3. Rollback Tables

There are two system generation tables and four system generation parameters that the Data Administrator must specify for rollback, all of which are in DMS 1100 systems generation parameter, element DMSSGP. The first table is table QLSEGT, which contains groups of two words. Each quick-look file is divided into blocks, known as segments. (The number of segments and the size of each segment is arbitrary, except that the segment size must be at least the size of the largest possible page, plus 5 words for the header and the number of words needed to make the length an integer number of sectors, so the end sentinels will start on a sector boundary, plus 28 words.) Except for the first two words in the table, each two word group in QLSEGT corresponds to a segment. The first n segments, where n equals NUMBRU - maximum number of run units allowed in the system, are allocated as the first segments for the run units. The first word for the segment following the first segments is given the label QLSACQ, and this and all following segments are used as overflow segments in case the run unit exceeds its initial segment. The first word in the table contains a 057 in S2 and zeros in the rest of the word. The pair of words in the table beyond these two header words each specify a segment, and contain:

First word of each pair:

S1 - Unused. Contains binary zero.

S2 - The binary segment number, with "1" as the lowest number.

S3 - Contains a binary pointer to the QLSEGN table, with "1" as the lowest number. This specifies the file name this segnment is to be stored in.

H2 - Must contain a binary zero, DMR may alter its contents during execution, but assumes it is zero initially. When it is zero, DMR assumes the segment has not been used. When it is not zero, DMR assumes it has been used.

Second word of each pair:

H1 - Contains the binary length of the segment in sectors as explained above.

H2 - Contains the binary relative start address, in sectors, of the beginning of the segment in its quick look file, with a "0" as its lowest possible value.

The second table is table QLSEGN, which also consists of groups of two words, with each group containing a left-justified, twelve character literal quick look file name. For example, if the Data Administrator would want two quick look files, named QUICK-LOOK1 and QUICK-LOOK2 his QLSEGN table would be:

```
QLSEGN*    'QUICK-LOOK1'
           'QUICK-LOOK2'
```

A QLSEGN table containing precisely these values is in the symbolic element DMSSGP.

The system generation parameters are QLSIZE, NUMSIZE, NUMSEG, NUMFLN, QLF, ATT, and ATTFN. In performing rollback, DMR allocates a buffer from the buffer area to contain the pages and their header and trailer items when they are read from a quick look file, prior to being rewritten into the database. QLSIZE specifies that buffer size, and is calculated, at a minimum, the same way a segment length would be. It is usually larger than that to allow more than one page to be read at a time. For example, if it is known that no page will be longer than one track, then QLSIZE could be:

```
QLSIZE    EQU    1848    (default value is DMSSGP)
```

The parameter NUMSEG is the total number of segments set up, i.e. the number of two word QLSEGT entries (excluding the two word header). It must be greater than or equal to the maximum number of RU's i.e. system generation parameter NUMBRU.

NUMFLN is the number of quick look files assigned i.e. number of two word QLSEGN entries. NUMFLN = 2.

QLF indicates whether a quick look file is present. QLF = 1 if assigned, QLF = 0 if not assigned. The quick look file tables are conditionally generated by this parameter. Also, code dealing with the quick look file is conditionally generated based on this parameter. QLF = 1.

An example of all of these entries in DMSSGP is that, due to mass storage limitations, it may be desirable to allocate the first segments to high speed drum (say, 100 tracks). Then, when that space is filled, to place the segments on a slower drum, perhaps also allocating more space (say, 200 tracks). Further, assume that no page is longer than one track. Then the QLSIZE parameter and the QLSEGN and QLSEGT tables would be:

```
QLSIZE    EQU    1848
NUMSEG    EQU    10.
NUMFLN    EQU    2.
QLF       EQU    1.
QLSEGT**  +      0057,0.0
          +      0,0,0,0,0,  NUMSEG-1
QLSADD**  +      0101,0      segment #1  first quick look
 first                                   file name is QLSEGN
segment   +      1280,0      segment starts at sector 0
                             length, in sectors, of this
                             segment
          +      0201,0
          +      1280,12080
          +      0301,0
          +      1280,2560
          +      0410,0
          +      1280,3840
          +      0501,0
          +     1280,5120
QLSACQ**        0602,0        second quick look file name
 sixth                                   in QLSEGN
segment   +     2560,0
          +     0702,0
          +     2560,2560
          +     01002,0
          +     2560,5120
          +     01102,0
          +     2560,7680
          +     01202,0
          +     2560,10240
QLSEGN**  'QUICK-LOOK1'       first quick-look file name
          'QUICK-LOOK2'       second quick-look file name
```

Note the specific labels that must have two asterisks(*) following each when actually placed in DMSSGP. Also, if more than one segment is placed on file, the segments do not have to be contingunous, though space will be wasted if they are not. For example, one segment might go from sector 0 to sector 6400 in a quick look file, and the next segment might go from sector 6500 to sector 12800.

Note also that the use of an octal number (number preceded by a zero) in specifying the segment and quick look file numbers. This will result in the segment number being placed in S2 and the quick look file number in S3 of that word. The maximum number of segments that can be specified is 63, and the maximum number of quick look files that can be specified is 63. Also, the total combined length of all of the segments must be sifficient to hold all of the quick before looks written.

The label QLSACQ is placed on the first word of the first overflow segment. The values given in the preceding example are those contained in the DMS release tape.

Quick look files must be assigned at the time looks are taken by the DMR. The assignment may be done explicitly by the Application Programmer subject to the specifications of the Data Administrator, as in our example above:

```
@ASG,A  QUICK-LOOK1
@ASG,A  QUICK-LOOK2
```

If the quick look files are cataloged with the universal DMS qualifier they may be assigned dynamically by the DMR in the same way that the DMR dynamically assigns areas.

The following are included if TIP = 1:

TNUMSG	Number of TIP quick look file segments (TNUMSG = 10). It is the equivalent to NUMSEG
TNMFLN	Number of TIP quick look file (TNMFLN = 2)
TQLSGT**	It has the same purpose as QLSEGT
TQLSAD**	Is the equivalent of QLSADD
TQLACQ**	Is the equivalent of QLSACQ
TQLSGN**	Is the equivalent of QLSEGN

(the default values established for the number of TIP quick look file segments and their length are the same as those described above for EXEC 8 quick look files).

1.2.3. DMR Operating Configurations

There are several possible configurations of the DMR for testing on production use. The principal division is between single and multi thread use.

In the multithread (MT) mode a single copy of the DMR code controls concurrent access to the database by multiple run units. This multithread DMR may be declared as a reentrant processor (REP), as a single write enabled common bank (CDB) or as multiple common banks (MCB). A necessary condition to using the DMR in MT mode is the availability of test and set queuing, a feature of EXEC level 27.20.164 and later levels. MCB requires dual PSR hardware and the availability of the LBJ procedure, a feature of EXEC level 33R1. The DMR as a REP or CDB may be declared to be segmented or not.

In the single thread mode the DMR controls a single run unit. A copy of the DMR is collected with the run unit. Test and set queuing is not needed. The DMR may be generated as a single relocatable element, with or without segmentation, or as multiple named program banks (MPB) using multibanking with the BDL option.

In the latter case dual PSR hardware and the LBJ procedure of EXEC level 33R1 must be available.

The following table summarizes possible DMR configurations:

Multithread (MT)	Singlethread (ST)
Reentrant Processor (REP) *	Single relocatable element *
Common Data Bank (CDB) *	
Multiple Common Banks (MCD)	Multiple Program Banks (MPB)

* may be segmented or non-segmented

1.2.3.1. Single Thread DMR Mapping Procedures

1.2.3.1.1. Non-Segmented Single Relocatable Element

In this method the DMR is collected with the host language program. Obtain all required DMS elements from the first file of release tape or F1 of the new generation Place them in TPF$ for the collection.

```
@MAP     .RURB   ,MTTEST
    IN       TPF$.LINKER
    IN       TPF$.D$WORKNNNNNN
    IN       TPF$.DMR
    IN       TPF$.CLSEG$
    IN       TPF$.SORTBUF
```

where:

1) LINKER is the element which interfaces with the DML commands and the DMR

2) D$WORKNNNNNN (the six characters following D$WORK are the first six characters of the PROGRAM-ID in the IDENTIFICATION DIVISION OF THE COBOL Program) is the element produced by the DMLP.

3) DMR is the unsegmented DMR relocatable.

4) If a CALC routine is involved, see Appendix D of Data Manipulation Language Reference Manual for Additional @MAP considerations.

5) If a set whose mode is pointer array is being initially loaded, include SORTBUF.

1.2.3.1.2. Segmented Single Relocatable Element

Because the segmented collected DMR must start at location 01000, a relocatable collection of the run unit must be generated as follows, assuming all elements are in TPF$:

```
@MAP,R     .RURB,MTTEST
     IN     TPF$.LINKER
     NOT    TPF$.DMR
     IN     TPF$.D$WORKNNNNNN
     etc.
```

Then,

```
@MAP,A   , .RUNABS
     IN     TPF$.DMR
     IN     TPF$.MTTEST
```

1.2.3.1.3. Multiple Program Banks

This method is possible for a DMR generated with multibanking BDL option. All DMR elements are assumed to be in TPF$ including the element F4.MBMAP which is built by DMS system generation to describe the multiple program banks of the DMR.

```
@MAP,A      RURB,STTEST
@ADD        TPF$.,BMAP
   IBANK,M  PROGBANK,01000
   (include here program I bank routines)

DBANK,MC    PROGBANK,n
  IN        TPF$.LINKER
  IN        TPF$.D$WORKNNNNNN
  IN        TPF$.CLSEG$
  IN        TPF$.SORTBUF
(include here program D bank routines)
```

where:

n is the value specified as DBNKST in DMSSGP as the beginning D Bank address.

1.2.3.2. Multithread DMR Mapping Procedures

1.2.3.2.1. Reentrant Processor

```
@MAP,A      RURB,MTTEST
 IBANK,M    PROGIBANK, 01000
 (include here all run unit I bank routines)

 DBANK,MC   PROGDBANK, n
   IN       TPF$.LINKER
   IN       TPF$.D$WORKNNNNNN
   IN       TPF$.CLSEG$
   IN       TPF$.SORTBUF
 (include here all run unit D bank routines)
```

where:

1) LINKER was created by an appropriate systems generation to enable interfacing with the DMR as a REP. It was taken from th- second file of the output tape.

2) The starting address of the DBANK, n, is higher than the highest I bank address within the DMR REP. It's value is the same as DBNKST of DMSSGP.

3) The DMR is <u>not</u> included.

4) The DMR REP must be established as a system standard reentrant processor using the REPROG card with a

Q option. The Q option indicates test and set queuing is used in the REP.

1.2.3.2.2. Common Data Bank

1) Linker was created by a system generation which specified the multithread DMR to be built as a Common Data Bank.

2) The DMR common data bank must be established as a standard write enabled common bank using the method described in IV.1.2.4.1 of this paper.

1.2.3.2.3. Multiple Common Banks

The method here is the same as that used for a REP except:

1) LINKER was created by a system generation which specified the multithread DMR to be built as multiple banks.

2) Each of the DMR banks Must be established as a standard common bank using the method described in IV.1.2.4.2 of this paper.

1.2.3.2.4. Segmented REP or CDB

The mapping method is the same as for the reentrant processor IV.1.2.3.2.1.

1.2.4. Registering the DMR as Common Bank(s) with the Operating System

1.2.4.1. Single Common Data Bank

A number of interrelated steps must be taken to register the DMR as a common bank with the operating system. This section outlines an acceptable approach for level 31 and above.

(1) Update RLIB$.CERU$ with an entry to associate a site-selected bank descriptor index (BDI) with the common bank name, here denoted generically as the BDITAG. The symbolic entry is of the form:

```
BDITAG*   EQU   BDI
```

The name used as BDITAG must be the name used as the definition of CDBNAM in the DMS generation, step 2 below. CERU$ should be the only place where the BDI is hard coded. Levels 71 and later versions of RLIB$ have a default definition of the form:

```
DMR$*     EQU   0400071
```

(2) Generate a new common bank DMR using the standard generation run stream. DMS system generation

parameter CDB must be set to 1. As noted above CDBNAM must agree with the BDITAG used in ERU$. The updated copy of RLIB$ propared in step 1 is needed in this DMS generation to satisfy references from LINKER, TIMER, and certain stand alone utility programs.

(3) Register the common bank with the operating system by including a REENTRANT SGS card in the generation of the operating system. This card has the general format:

REENTRANT BANKS, OPTIONS ARE 'ELEMENTNAME' BDITAG

where

REENTRANT is the label and must be spelled as shown

OPTIONS has the form A+B+C. Allowable options for the DMR are:

D - Dynamic Bank
S - Static Bank
NP - the positioning when loading this bank
RP - requires primary storage
PP - prefers primary storage
PE - prefers extended storage
RE - requires extended storage

Q - test and set queuing for this bank (required for the DMR).

'ELEMENTNAME'	is the FIELDATA name if the absolute element.
BDITAG	is the name of the common bank used in CERU$ of step 1 and used as the definition of CDBNAM in step 2.

The generation skeleton will build from this information a 'REPROG' card within the Proc 'REPROG' of element CONFIG.

(4) Copy the absolute element containing the common bank DMR prepared in step 2 into LIB$ of the boot tape with the elementname used on the REENTRANT BANK card of step 3.

(5) Collect application programs to include the common bank version of LINKER from file F2 built in step 2.

For additional information see:

Section 1.4.2.6 of Operating Systems Memorandum, rev. 14. Section 4.1.8 of Operating Systems

Memorandum, rev. 14. Example section 1.6 of Operating Systems Memorandum, rev. 14.

1.2.4.2. Multiple Common Banks

Registering multiple banks is a natural extension of the method used to register a single bank.

(1) Each bank must have an entry in SYS$*RLIB$.CERU$ The names used as the BDITAGs must match, one for one, with the names supplied on the CONTROLBANK, BANK and DMRBUF cards of the DMS system generation in step 2.

(2) Generate the DMR as multiple banks using the standard generation run stream. As noted above the bank names used must agree with entries in CERU$. In the case of the TAB option the BDIs supplied for the banks must also agree with the entries in CERU$. The updated copy of CERU$ prepared in step 1 is needed in this DMS generation to satisfy references from LINKER, TIMEF and certain stand alone utilities.

(3) Register each common bank with the operating system as for a single common bank. Two additional options are allowed.

W - write protected bank
G - guaranteed entry bank

All banks except the DMRBUF bank may be write protected; at least the DMRBUF bank should be a guaranteed entry bank.

Also note that BDITAG is the name of the common bank used in CERU$ of step 1 and used as the bank name on the CONTROLBANK, BANK or DMRBUF cards of step 2.

(4) Copy each element containing one of the multiple DMR common banks prepared in step 1 into LIB$ of the boot tape with the elementname used on the REENTRANT BANKS card of step 3.

(5) Collect application programs using the multiple common bank version of the LINKER from file F2 built in step 1 as described in IV.1.2.3.2.3.

1.2.5. Mechanics of DMS System Generation

Included in the DMS release tape is a program to control the generation of DMS systems. This program, DMSUP, is contained on files 3, 4, and 5 of the release tape. This program is designed to be added via @ADD within a run stream envelope as described below. Input to this process includes.

1) an existing set of files from a DMS release tape or previous generation.

2) the temporary correction file (TCF).

3) Stream Generation Statements (SGS).

Output from this process is a set of files with all indicated corrections applied. These output files may be directly used as input to a subsequent generation.

1.2.5.1. Stream Generation Statements

DMSUP allows the user considerable flexibility over the DMS generation procedure itself. This is exercised by specifications included on a set of Stream Generation Statement cards. DMSUP will read these images from element F3.USERSGS. Some SGS cards are required for any generation, some are required for generation of a segmented or multibanked DMR, and some are truly optional.

All user-provided SGS statements must be placed in an element called 'USERSGS' in File 3 of the release tape. A default element, USERSGS, currently exists on the third file of the release tape. All required SGS statements are in the current USERSGS element, with default values. These default values are designed to ensure that system generations for non-segmented versions of the DMR will be the same as in previous releases.

General SGS Statements

i.	SYS	File-Name	Assembly Options , PDP and Map Options
	DMRMT$	File-Name	Assembly Options , PDP and Map Options
	PCFF	File-Name	Assembly Options , PDP and Map Options
	DMR	File-Name	Assembly Options , PDP and Map Options
	REPF	File-Name	Assembly Options , PDP and Map Options
	DMU	File-Name	Assembly Options , PDP and Map Options
	DDL	File-Name	Assembly Options , PDP and Map Options
	DML	File-Name	Assembly Options , PDP and Map Options
	ADML	File-Name	Assembly Options , PDP and Map Options

These 9 SGS correspond to the first 9 files on the release tape. The first field specifies the file-name for each tape file. The tenth file of the release tape contains the FORTRAN DML preprocessor.

The first subfield of the second field defines the assembly options, the second subfield defines the PDP and MAP options. This second field is optional; if omitted, the default value is S,L.

The assembly option, however, only applies to elements which are being assembled because the element had temporary corrections (an entry in the element TCF,TCF). When elements are assembled because a procedure (PDP element) has been changed, the assembly option is assumed to be 'RE'. (See iii below also).

By convention (in previous releases), the DMS tape files have been called F2, F3, ... etc. Also by convention, the assembly and map options have been S,L. Therefore, the values in the default element USERSGS are:

SYS	F1
DMRMT$	F2
PCFF	F3
DMR	F4

REPF	F5
DMU	F6
DDL	F7
DML	F8
ADML	F9

If the file for PCFF is given a name other than F3, then the name F3 must be attached via @USE to that filename before adding DMSUP. This is necessary since the name F3 is used in the @ASG Control Card.

ii	SWITCHES	RUACTS	0	1
	SWITCHES	REPON	1	0
	SWITCHES	TIMRON	1	0
	SWITCHES	SFASGK	1	0
	SWITCHES	ATASGK	1	0
	SWITCHES	ATT	1	0

These switches control the parameters which are turned on or off for the DMR REP. The default values in USERSGS are as shown above.

For example, the default REPDMR has the values given in field 1; RUACTS 0, REPON 1, TIMRON 1, SFASGK 1, ATASGK 1, ATT 1. The fourth field is used internally by the skeleton and should not be changed.

To change the default values of the REP DMR, the third file of the appropriate SGS card should be changed. To create a REP with ATT 0, the default SGS is USERSGS should be deleted and replaced with: SWITCHES ATT 0 0

```
iii LIST      N        N        N        N        N        N
              LIST  ,  LIST  ,  LIST  ,  LIST  ,  LIST  ,  LIST
```

The six subfields of the first field correspond to the DMR (single-thread version), DMR (multithread version) DMU, DDL, DMLP, ADMLP, respectively.

(This is the same order in which the DMS processors appear on the release tape). If the word 'LIST' appears in the subfield corresponding to a DMS processor, each element of the processor will be assembled, in addition to the merging of temporary corrections and update of the other processors.

The listing produced if the LIST option is used for the multithread DMR subfield contains only those elements which are different from multi-thread.

For example, 'LIST' as the first subfield will merge all temporary corrections, assemble all the elements in the DMR, and update the multithread DMR, DMU, DDL, DMLP, ADMLP, as indicated by the temporary correction file.

If the subfield is anything but 'LIST', the generated runstream will merge all corrections and update all necessary elements but will not necessarily produce a complete listing of the processor.

This SGS is required for system generation. If the element USERSGS is changed or re-created, a 'LIST' SGS must be included. The default USERSGS currently has the following:

```
LIST        N, N, N, N, N, N
```

Note that this SGS will cause all routines to be assembled; a <u>listing</u> will be generated only if the assembly option on the appropriate file SGS (3i, above) indicates to the assembler to produce a listing. If no assembly option is given, 'RS' option is assumed.

iv MSG ON

This SGS specifies that a message to the console is to be generated for each PDP and ASM element during system generation.

v BRKPT ON

The control card, '@BRKPT PRINT$' will be generated by the skeleton following the merge of the temporary correction file, and following the mapping of each of the DMS processors: DMR, REP, DMU, DMLP, ADMLP. The breakpoints are generated only for the processors which are updated.

Note: This SGS might be used in conjunction with the LIST SGS. if one or more DMS processors is to be LIST'ed.

vi REPONLY ON

If this SGS is present, only the DMR will be updated in the files corresponding to the first, second, fourth, and fifth files of the release tape. The utility routines associated with the DMR will not be updated. These are referred to as the 'stand-alone' utilities and include: TIMER, QLINIT, SFINIT, DTBSDMP1, DTBSDMP2, QUIREC, DMRACT, UPDATE, LONGRECOVERY, CHECKPOINT.

vii REP1ONLY ON

If this SGS exists only the stand-alone utilities will be updated in FIles 2 and 5; the multithread DMR will remain unchanged.

1.2.5.2. SGS Statements for a Segmented DMR

The element USERSGS contains a default segmentation scheme. But the user may provide his own segmentation scheme using the following types of SGS statements.

i MAINSEG 0 OVERLAYS DMR element, DMR element ,...

This SGS specifies the DMR routines to go in the main segment. The first two fields are optional: segment number (must be 0 if present) and the word OVERLAYS. The last field is the list of DMR routines to go in the main segment. There may be any number of subfields in this field; a semicolon continues the SGS to the next line.

For segmentation, exactly one MAINSEG SGS must exit.

ii OVERLAY NUMBER1 DMR element, DMR element ,...
OVERLAY NUMBER2 DMR element, DMR element ,...
. (any number of OVERLAY SGS's)
.
.

These SGS statements specify the overlayable DMR routines. Each overlay may be one or more DMR routines but a DMR routine may be specified in only one overlay.

The first field on an overlay SGS must be a unique, positive, nonzero number, which can be used to identify the overlay. The numbers need not be sequential.

For a <u>complete</u> DMR, each DMR routine must be specified on either the Mainseg SGS or on an Overlay SGS.

Routines which are not included will be given an effective overlay number -1. If, during execution of the DMR, one of those routines is referenced, a rollback error code of 22 will be returned. The first word of the field 'Error-area' in the DMCA will contain the address at which the bad routine was called, if the call was made from the main segment. It will contain the overlay number in H1 and offset from the overlay in H2, if the bad call was from an overlay.

```
iii  SEG   number1  OVERLAYS   overlay number,  overlay number
           number2  OVERLAYS   overlay number,  /
             .                                  /
             .    (any number of SEG SGS's)
```

The label SEG specifies the overlays to go into each segment other than the main segment. The first field is for the segment number, which must be a unique, positive, nonzero number. Segment numbers need not be sequential. The second field, the word 'overlays', is optional.

The last field is the list of overlays which can use this segment. The overlay numbers are those of the first fields of the overlay SGS. Each overlay number must appear at least once in the list of Seg SGS, but can appear on any number of different Seg SGS. That is, an overlay must be defined for at least one segment, but can be defined in many segments.

iv SEGMENT DMR, STATISTICS , UPDATE , NEWSEGS

This SGS statement must exist if the DMSSGP parameter 'SEG' is set to 1, and vice versa. The first subfield, 'DMR', is necessary only if no other subfield is used (as a 'placeholder' for the SGS statement). The three subfields, 'STATISTICS', 'UPDATE', and 'NEWSEG' are all optional and can appear in any order.

If the DMSSGP parameter 'STAT' is set to 1, the word 'STATISTICS' must be a subfield (and vice versa).

The two subfields 'UPDATE' and 'NEWSEG' apply only to Segmentation system generations after the initial generation. For the initial system generation, every element in the DMR must be assembled to insure that procedure calls are satisfied correctly. Subsequent generations which do not change overlay numbers, entry points, or the main segment elements do not change the procedure references, hence all DMR elements need not be assembled. The word 'UPDATE' as a subfield on the 'SEGMENT' SGS signifies this condition. 'UPDATE' can only be specified after an initial segmentation system generation has been performed and the resultant DMR files saved (see vi below).

'NEWSEG' has meaning only in conjunction with the phrase 'UPDATE'. This is a special case of an 'UPDATE' system generation where the 'SEG' SGS statements have been changed from the initial system generation. The 'OVERLAY' and 'MAINSEG' statements cannot be changed without a full (non-update) system generation because of procedure references, but the 'SEG' SGS can be changed when 'NEWSEG' is present as a subfield.

v	DMRSEGMENTFILE	file-name, TIP
	REPSEGMENTFILE	file-name, TIP

These statements specify the file-names for the segment-files. Two segment files must be created: one reflecting the singlethread DMR, one for the reentrant DMR.

If the first field has a second subfield (i.e., TIP) that segment-file will be assumed to be a TIP file. System generation will use TIP I/O in writing to the file number given in subfield one.

These SGS are optional. If omitted, temporary EXEC 8 files will be assigned; DSEG for the single-thread DMR, RSEG for the REP.

The parameter 'ESEGNAM' (EXEC 8) or 'TIPSEGNUM' TIP I/O) in DMSSGP is the name of the segment-file in use at execution time. For system generation, two names for segment-files number be provided. At execution time, the appropriate segment-file (single-thread or MT) must be copied into the file name specified by DMSSGP.

```
vi  SEGDMR     file-name
    SEGREPF    file-name
```

In addition to creating the two segment-files, the output of a segmentation system generation is two files equivalent to Files 4 and 5 of the release tape; where all DMR routines are assembled for segmentation. These files should be saved: They can be used as input to an 'update' segmentation build.

Therefore, it may be convenient to distinguish between the non-segmented and the segmented DMR files (Files 4 and 5). The use of the 'SEGDMR, SEGREPF' SGS accomplishes this distinction.

If the release tape files 4 and 5 are copied into F4 and F5, respectively, there are several possibilities.

a)
```
SEGDMR     F4SEG          (where F4SEG, F5SEG are
                          user-supplied file names).
SEGREPF    F5SEG
```

Then the skeleton assumes files F4SEG and F5SEG are assigned. On an initial segmentation generation the following will be generated.

```
@COPY     F4., F4SEG.
@COPY     F5., F5SEG.
     .
     .   (Segmentation processing)
     .
```

All segmentation processing will be done in F4SEG and F5SEG; F4 and F5 will be unchanged.

In addition to the input files, F4SEG and F5SEG should then be copied out to tape, to be used as input to 'UPDATE' segmentation builds.

b) SEGDMR F4

SEGREPF F5

In this case, the input files F4 and F5 will not be saved in their non-segmented state.

c) No SGS of Type 'SEGDMR, SEGREPF'.

For the initial segmentation generation, temporary files will be assigned by the skeleton. VVV, corresponding to F4 and XXX, corresponding to F5. All segmentation processing will be done in the temporary files VVV and XXX; F4 and F5 will be unchanged.

For an 'UPDATE' build, with no 'SEGDMR' or 'SEGREPF' SGS, the skeleton assmues the segmented DMR file to be assigned and called F4 and the segmented REP file to be assigned and called F5.

The preceding discussion detailed the procedures for turning segmentation on in the DMR. If a segmented version of the DMR is saved and used as input to create a non-segmented DMR certain other procedures are necessary. Since segmentation changes the CALL proc, each DMR routine must be assembled when segmentation is turned on or off in the DMR. So in addition to setting SEG = 0 in DMSSGP and deleting the 'SEGMENT' entry in the element USERSCS, an entry for *TABC must be included in TCF.TCF. Changes to the proc DMRTAB will force assembly of every DMR routine.

Note that this is only necessary if the non-segmented version of the DMR is not saved.

1.2.5.3. Temporary Correction File

The temporary correction file (TCF) consists of a single element file named TCF.TCF which is assigned before adding DMSUP. This element is the major source of input to DMSUP. The TCF becomes part of the generated output in a two stage process. In step one the TCF is merged with an existing set of corrections called the permanent correction file (PCF). This is the set of all coding changes made since a base period. The PCF is then merged against the base symbolics. Individual routines are assembled and processor collected. The resultant relocatable and absolute elements constitute the output of the generation.

Each symbolic element of the DMS system has associated with it a correction element. Generally the name of the correction element is the name of the source element with a final letter C appended. To make changes against a source element of any DMS routine use the process:

1) Insert into TCF.TCF a line of data consisting of an asterisk in column one followed by the name of the correction element.

2) Indicate the line numbers affected. The line numbers refer to base level symbolics or line in the PCF. Use the normal SSG conventions.

3) Include the new code to be inserted, if any.

Example:

```
@ELT,IL     TCF.TCF
*SGPC
-27,27
CDB           EQU           ON
*DH30C
-19,20
              L,U           A3,017
```

In this example two changes are being made. SGPC is the correction element for DMSSGP. The change made is to remove line 27 (presumably it is CDB EQU OFF.) and replace it with CDB EQU ON. DMSUP will make all changes to DMS routines which are implied by generating a common data bank version of the DMR.

The second change is to remove two lines from DH30 and replace them with a single new instruction.

The element TCF.TCF is expected to be available by DMSUP. A given correction element name may appear only once in TCF.TCF and line numbers must be in ascending sequence.

IV. 2.

PROCEDURES FOR USING DMS-1100
IN A
TEST OR PRODUCTION ENVIRONMENT

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July, 1976

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Introduction

The purpose of this document is to provide the DMS-1100 user with a set of basic rules for constructing a REP/CDB DMR system and for executing programs in a test/production environment in a multi-thread system.

The document is divided into four parts:

System Construction
System Initialization
Testing
Recovery Techniques

In addition, six appendices describes the error messages in greater detail.

CONSTRUCTION

Constructing REP/CDB DMR

List Release Tape

The procedure to list the element from the base release tape is illustrated by Figure 1.1.

1. Load the files from DMS release tape into catalogued files F1, F2, ..., F9 and, if present, F10.

2. Use the @ADD streams to print the contents of the desired file(s).

Construct CDB DMR

The procedure to construct a CDB DMR is illustrated by Figures 1.2-1.3. Observe that CDB=ON and CDBAPT=OFF on standard release tape.

1. Establish a runstream similar to the one in Figure 1.2.

2. Obtain a listing of contents of: (Reference: Appendix F, Pages 26 - 40)
    a. F3.SGS
    b. F3.USERSGS
    c. F4.DMSSGP/BASE

Inspect Element SGS for the correct TCF element name entries. For example, the element name entry for IV02 is IV02C. The element name entry for DMSSGP is SGPC. Inspect USERSGS for correct line numbers of SGS to be altered. Inspect DMSSGP/BASE for the correct line numbers of the DMSSGP parameters to be altered. Observe that the switches for REPON, TIMRON, and ATT appear in USERSGS and are turned on by default. Consequently, do not modify the corresponding switches in DMSSGP; otherwise, two copies of the REP DMR will be obtained.

3. Update F3.USERSGS, if necessary.

4. Establish corrections into TCF, a correction file, (Reference: Figure 1.2, Page 4), if necessary.

Construct Boot Tape

The procedure to construct a boot tape is illustrated in Figure 1.3. DMR must be registered as DMR (REP) or DMR$ (CDB) in this library on the boot tape.

PROCEDURES FOR GENERATING LISTINGS

```
@RUN            LIST,          ,DMS,10,1000
@ASG,T          IN.,T, Release Tape
@ASG,T          F1.,F2///1000
@ASG,T          F2.,F2///1000
@ASG,T          F3.,F2///1000
@ASG,T          F4.,F2///1000
@ASG,T          F5.,F2///1000
@ASG,T          F6.,F2///1000
@ASG,T          F7.,F2///1000
@ASG,T          F9.,F2///1000
@COPY,G         IN.,F1.
@COPY,G         IN.,F2.
@COPY,G         IN.,F3.
@COPY,G         IN.,F4.
@COPY,G         IN.,F5.
@COPY,G         IN.,F6.
@COPY,G         IN.,F7.
@COPY,G         IN.,F8.
@COPY,G         IN.,F9.
@FREE           IN.
@ADD,P          F4.DMRLIST (For a listing of DMR,REP and collectable)
@ADD,P          F4.SEGDMRLIST (For a listing of the segmented DMR,
                 REP and collectables)
@ADD,P          F5.REP1LIST (For the stand-along utilities)
@ADD,P          F6.DMRLIST (For a listing of DMR utilities)
@ADD,P          F7.DDLLIST (For a listing of DDL)
@ADD,P          F8.DMLLIST (For a listing of the FD-DML)
@ADD,P          F9.ADMLLIST (For a listing of ASCII-DML)
```

Note 1: If corrections are to be merged at the same time you may use the regular system generation procedures but include the appropriate 'LIST' SGS to generate a list. The listing obtained by the LIST statement does not include PDP or ELT listings.

Note 2: SEGDMRLIST
This element should only be added after an 'initial' segmentation build has been generated and saved. The listing will reflect the segmentation scheme in USERSGS.

Note 3: To obtain a listing of the FORTRAN DMLP components place the LISTINGS SGS in USERFSGS.

Figure 1.1

```
@ELT,ILD  DMSFL.T,.ENDFIL
ELT0T7 RLIB70 04/27-11:32:40-(,0)
000001        000    @ASG,T  IN.,16N,91790
000002        000    @DELETE,C F1.
000003        000    @DELETE,C F2.
000004        000    @DELETE,C F3.
000005        000    @DELETE,C F4.
000006        000    @DELETE,C F5.
000007        000    @DELETE,C F6.
000008        000    @DELETE,C F7.
000009        000    @DELETE,C F8.
000010        000    @DELETE,C F9.
000011        000    @DELETE,C F10.
000012        000    @ASG,UP F1.,F2///2000
000013        000    @ASG,UP F2.,F2///2000
000014        000    @ASG,UP F3.,F2///2000
000015        000    @ASG,UP F4.,F2///2000
000016        000    @ASG,UP F5.,F2///2000
000017        000    @ASG,UP F6.,F2///2000
000018        000    @ASG,UP F7.,F2///2000
000019        000    @ASG,UP F7.,F2///2000
000020        000    @ASG,UP F8.,F2///2000
000021        000    @ASG,UP F9.,F2///2000
000022        000    @ASG,UP F10.,F2///2000
000023        000    @COPY,G IN.,F1.
000024        000    @COPY,G  IN.,F2.
000025        000    @COPY,G IN.,F3.
000026        000    @COPY,G IN.,F4.
000027        000    @COPY,G IN.,F5.
000028        000    @COPY,G IN.,F6.
000029        000    @COPY,G IN.,F7.
000030        000    @COPY,G IN.,F8.
000031        000    @COPY,G IN.,F9.
000032        000    @COPY,G IN.,F10.
000033        000    @FREE  IN.
000034        000    @ELT,UL  F3.USERSGS
000035        000    @ASG,UP TCF.,F2
000036        000    @ELT,IL TCF.TCF
000037        000
000038        000
000039        000
000040        000
000041        000
000042        000
000043        000    @ADD,P F3.DMSUP
000044        000    @ASG,T OUT.,16N,92791
000045        000    @PACK  F1.
000046        000    @PACK  F2.
000047        000    @PACK  F3.
000048        000    @PACK  F4.
000049        000    @PACK  F5.
000050        000    @PACK  F6.
000051        000    @PACK F7.
000052        000    @PACK  F8.
000053        000    @PACK  F9.
000054        000    @PACK F10.
000055        000    @COPY,GM  F1.,OUT.
000056        000    @COPY,GM F2.,OUT.
000057        000    @COPY,GM F3.,OUT.
000058        000    @COPY,GM F4.,OUT.
000059        000    @COPY,GM F5.,OUT.
000060        000    @COPY,GM F6.,OUT.
000061        000    @COPY,GM F7.,OUT.
000062        000    @COPY,GM F8.,OUT.
000063        000    @COPY,GM F9.,OUT
000064        000    @COPY,GM F10.,OUT.

END ELT.

@FIN
```

```
*SGPC
-147,147
TIP          EQU    ON
-175,176
PAGLEN       EQU    4500
TIPLEN       EQU    4500
@EOF
```

Figure 1.2

```
@ELT, LD  BOOT,,END
ELTOT   RLI070 08/05-16:39:13-(,0)
00000          000    @DELETE,C    DMRMT.
00000          000    @ASG,CP    DMRMT.,F2///2000
00000          000    @ASG,T    DMSTAPE.,16N,90712
00000          000    @MOVE DMSTAPE.,1
00000          000    @COPY,G  DMSTAPE.,DMRMT.
00000          000    @FREE DMSTAPE.
00000          000    @ASG,T    OLDBOT.,16N,1463
00000          000    @ASG,T    NEWBOT.,16N,91496
00000          000    @COPY,M OLDBOT.,NEWBOT.,3
00001          000    @ASG,T TEMP.,F40/5/POS/60
00001          000    @COPIN  OLDBOT.,TEMP
00001          000    @COPY,A    DMRMT.DMR,TEMP.DMR$
00001          000    @PREP    TEMP.
00001          000    @COPOUT  TEMP.,NEWBOT.
00001          000    @COPY,MN    OLDBOT.,NEWBOT.,8

END E  T.

@FIN
```

Figure 1.3

INITIALIZATION

Initializing REP/CDB DMR

The procedure to initialize the DMS system is as follows:

1. Boot the system with the boot tape containing the newly constructed REP/CDB DMR. A Jump Key 4 boot may be used to load new libraries.

2. Place the second file of the DMS tape containing the new REP/CDB DMR into a catalogued file, DMS*DMRMT.

3. Execute SFINIT

   Upon completion, SFINIT will display the message:

   "DMS-SYS-FILE HAS BEEN INITIALIZED"

   SFINIT initializes the system files; i.e. DMS-SYS-FILE. SFINIT should only be executed at the start of DMS initialization. The systems file is revised to reflect changes in the system over time. Consequently, once a database has been loaded, the systems file should not be reinitialized, i.e. SFINIT should not be executed again.

4. Execute QLINIT*

   Upon completion, QLINIT will display the message:

   "ALL SEGMENTS OF THE QLF ARE INITALIZED"

   QLINIT initializes the quick-look files. QLINIT should be executed at the start of DMS initialization and when a new system is booted. If one is attempting to recover from a DMR abort, one should not execute QLINIT. That is because the quick-look files contain information needed by Quick Recovery to restore the database.

5. Execute QUIREC (optional)

   Upon completion, QUIREC will display the message:

   "QUICK-RECOVERY FINISHED"

   QUIREC will initiate TIMER. TIMER will request the assignment of an audit trail tape and write a checkpoint on it after quick recovery has finished.

   QUIREC is optional and need not be executed at the start of system initialization. In that case, the first DMS run unit or TIP transaction will initiate TIMER. And, if audit trail tapes are used, then an audit trail tape will be requested to be mounted and the next tape number will be requested.

* If TIP=ON, then quick-look files must be reserved accordingly before QLINIT is executed (Reference: Figure 2.1, Page 11, TIPCAT and TREGS).

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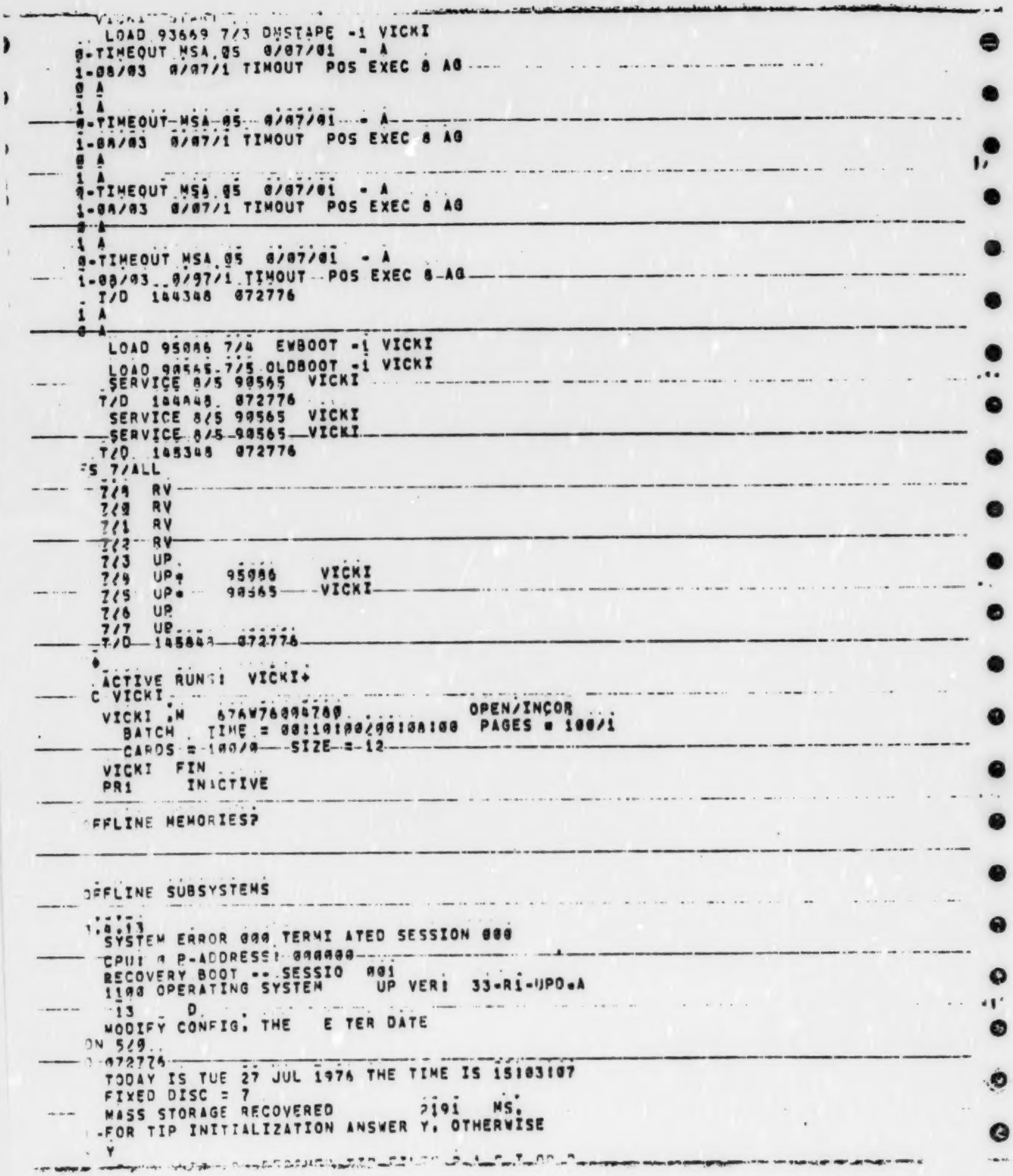

```
      VICKI [illegible]
    .. LOAD 93669 7/3 DNSTAPE -1 VICKI
   0-TIMEOUT MSA.05  0/07/01  - A
   1-08/03  0/07/1 TIMOUT  POS EXEC 8 A0
   0 A
   1 A
   0-TIMEOUT MSA 05  0/07/01  - A
   1-08/03  0/07/1 TIMOUT  POS EXEC 8 A0
   0 A
   1 A
   0-TIMEOUT MSA.05  0/07/01  - A
   1-08/03  0/07/1 TIMOUT  POS EXEC 8 A0
   0 A
   1 A
   0-TIMEOUT MSA.05  0/07/01  - A
   1-08/03  0/07/1 TIMOUT  POS EXEC 8 A0
   . T/D  144348  072776
   1 A
   0 A
      LOAD 95086 7/4  EWBOOT -1 VICKI
      LOAD 90565-7/5 OLDBOOT -1 VICKI
      SERVICE 8/5 90565  VICKI
     T/D  144848  072776
      SERVICE 8/5 90565  VICKI
      SERVICE 8/5 90565  VICKI
     T/D  145348  072776
   FS 7/ALL
     7/0  RV
     7/0  RV
     7/1  RV
     7/2  RV
     7/3  UP
     7/4  UP*    95086    VICKI
     7/5  UP*    90565    VICKI
     7/6  UP
     7/7  UP
     T/D  145848  072776
   *
    ACTIVE RUNS:  VICKI+
    C VICKI
     VICKI .M   676W76094700             OPEN/INCOR
       BATCH  TIME = 00:10:00/00:0A:00  PAGES = 100/1
       CARDS = 100/0   SIZE = 12
     VICKI  FIN
     PR1     INACTIVE

   FFLINE MEMORIES?


   OFFLINE SUBSYSTEMS

   1.0.13
     SYSTEM ERROR 000 TERMI ATED SESSION 000
     CPU: 0 P-ADDRESS: 000000
     RECOVERY BOOT -- SESSIO  001
     1100 OPERATING SYSTEM     UP VER:  33-R1-UPD.A
     13    D
     MODIFY CONFIG, THE   E TER DATE
   ON 5/0
     072776
     TODAY IS TUE 27 JUL 1976 THE TIME IS 15:03:07
     FIXED DISC = 7
     MASS STORAGE RECOVERED        2191   MS.
    -FOR TIP INITIALIZATION ANSWER Y, OTHERWISE
     Y
```

Figure 2.1

7

```
  W= INITIALIZE OR RECOVER TIP FILES
   MASTER LOG ASSIGNO
  @ R
   ALG
   NUALG
    TIP FILE CO TROL RECOVERY COMPLETE
   ESORMSG
 ..COB
  UP
   PMD
   FOR
   UP   KEY ERROR
   PDP
   MAP
   ASM
   FURPUR
   LFT
   CULL
   LIST
   FLUSH
   QUEUE
   SIP1
   I TERP
   SLP2
   CFOR
   MAPING
   SLP1
   CFORIN
   DPLAY
   MAP23
   ELT
   ACTSCB
   DATA
   ERRORELT
   BASIC
   BASICS
   AAAHOL
   DMR1$
   DMR2$
   DMR3$
   DMR4$
   DMR5$
   COMM D
   TSTDBK
   TSTIBK
   RFORSI
   ROFRSI
   RFOR
   IOCB$
   NWBCB$
   CTS
   CTSSI
   BFORSI
   BSCA $
   HELP
   FOP
   FLIST
   SCOMP
   FILEDIT
   FLEX
   MST
   ACOB
   C2E$
   C2F$
   C2S$
   C2D$
```

```
C24.
ACOB$1
ACOB$2
ACOB$3
ACOB$0.
ACOB$5A
ACOB$5L
ACOB$6
FT.
FTN$I
FTN$L.
FTNSXR
FTN$3
FTN$2
FTN$9
CBANK
DOW.
MS33
QUIP
SSG...
RECERR
ED
ED$.
CM REP
ASM
TSFLIT
TFLIT$
FLIT
MASM
MASM3
MASMS
DOC
DIRVER10
DMR
PTS
FURPR$
SECURE
DPREP
TSS
TSS
RMATH$
DMATH$
CMATH$
COMATH$
PL1$U
PL1$E
PL1$1
PL1$2
PL1$3
PL1$8
PL1$9
PL1$5
PL1
FANG
FANG$R
PULL
DMR$
APLREP        OT IN LIB$
APL$M0       NOT IN LIB$
APL$M1        OT IN LIB$
RFOR$         OT IN LIB$
ROFR$         OT IN LIB$
F$LIT         OT IN LIB$
FTN$U         OT IN LIB$
C2SSDF       NOT I  LIB$
C2ANSI       NOT IN LIB$
```

```
   C2DSUP         OT IN LIBS
   C2ERR          OT IN LIBS
   C2FIN          OT I  LIBS
   PIRCB$        NOT I  LIBS
   DMR4$         NOT IN LIBS
   PL1$1         EXECUTABLE ONLY ON 1110
   PL1$2         EXECUTABLE ONLY O  1110
   PL1$3         EXECUTABLE O LY O  1110
   PL1$R         EXECUTABLE ONLY O  1110
   PL1$4         EXECUTABLE O LY ON 1110
   PL1$5         EXECUTABLE ONLY ON 1110
   PL1$E         EXECUTABLE ONLY ON 1110
   PL1$U         EXECUTABLE ONLY ON 1110
   SYS    START
   SYS*MSG: RLIBS INITIALIZED
   SYS*MSG: ALTLIBS
 UP 7/3/4/5/6
   SYS*MSG; ALTLIBS2
   SYS*MSG: CLIBS
 UP 9/3/5/6
   SYS*MSG: NEWSS
   SYS*MSG: APL*NEWSS
   SYS    FIN
   MAI  STORAGE 0434K
   9/3  UP
   9/5  UP
   9/6  UP
   PR1     INACTIVE
   PR2     INACTIVE
   LOADDM  RG  U9V, DMSOUT
   CR1    INACTIVE
 CS A
    LOAD DMSOUT 7/0 IN -1 LOADDM
   LOADDM START
 FS 7/ALL
   7/0  UP
   7/0  UP*    DMSOUT   LOADDM
   7/1. UP
 D  7/0
   7/2  UP
   7/3  UP
   7/4  UP
   7/5  UP
   7/6  UP
   7/7  UP
   7/8  DN
 FS 7
   08  UP AVAIL
   07  UP AVAIL
   LOADDM FIN
   PR1     INACTIVE
   SQ*
   .NO PRINT/PUNCH FILES QUEUED
 T*
   ACTIVE RUNS:-NO.E
   T/D  151100  072776
   RRB     RG  U9V, 100217
   CR1    INACTIVE
   RRB    START
    LOAD 100217 7/1 IN -1 RRB
 RV 7/0/1/2/3/7
   RRB    FIN
   7/0  RV
   7/1  RV
   7/2  RV
   7/3  RV
```

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```
     7/7  RV
   FS 7/ALL
     7/8  D
     7/0  RV
     7/1  RV
     7/2  RV
     7/3  RV
     7/4  UP
     7/5  UP
     7/6  UP
     7/7  RV
   ST POL*WSG3,TIPCAT,,,A
     ST KEY ERROR
     PR1      I ACTIVE
     LOAD     RG  U9V, 96777
     CR1    INACTIVE
      LOAD 96777 7/4 IN -1 LOAD
     LOAD   START
   ST DMS*WSG3,TIPCAT,,,A
     ST KEY ERROR
   ST DMS*WSG,TIPCAT,,,A
   0-TIPCAT UNDEF ACCT A         AER
   0 E
      LOAD 93985 7/5 TIPCATTAPE -1 TIPCAT
     TIPCAT START
   T*
     ACTIVE RU S:  LOAD+  TIPCAT+
   CS H
   ST DMS*WSG,TREGS,,,A
   BL*
     BACKLOG:  TDREGS
     LOAD   FIN
   SG*
     TIPCAT FIN
     PR1       2 FILES     4 PAGES
     T/D  151600  072776
   CS A
     PR2      I ACTIVE
     PR1      INACTIVE
     TDREGS START
   T*
     ACTIVE RU S:  TDREGS+
     TDREGS FI
   SG*
     PR1          FILE      22 PAGES
   SG PR *
     PR1      TDREGS PR         22 PGS M PR1
     CR1    INACTIVE
     SFINIT START
     PR1      INACTIVE
   0-SFINIT*REEL  FOR FIRST AUDIT TRAIL TAPE (90XXXX)
   0 300001
   0-SFINIT*MTU TYPE FOR AUDIT TRAIL TAPES (XXX)
   0 16N
     SFINIT*DMS-SYS-FILE  HAS BEEN INITIALIZED.
     SFINIT FI
     PR1      INACTIVE
     CR1    I ACTIVE
     GLINIT START
     GLINIT*ALL SEGMENTS OF THE GLF ARE INITIALIZED
     GLINIT FIN
     PR1      I ACTIVE
     CR1    I ACTIVE
     LIB2   START
   T*
     ACTIVE RUN :  LIB2+
   LIB2  .M   676W76004780                OPEN/INCOR
     BATCH . TIME = 00:10:00/00:00:48  PAGES = 100/24
     CARDS = 100/0   SIZE = 15
 RC LIB2
   LIB2  .M   676W76004780                OPE /I COR
     BATCH   TIME = 00:10:00/00:01:33  PAGES = 100/48
     CARDS = 100/0   SIZE = 24
 T◆
   ACTIVE RU SI  LIB2+
   LIB2*000000
   LIB2.  FIN
   LIB2*
 SM PR1 E
   PR1      I ACTIVE
   CR1    I ACTIVE
  ..TEST3  START
 T◆
   ACTIVE-RU-SI-- TEST3+
 RC TEST3
   TEST3 .M   676W76004780                OPEN/INCOR
     BATCH . TIME = 00:10:00/00:00:35  PAGES = 100/7
     CARDS = 100/0   SIZE = 32
 RC TEST3
   TEST3 .M   676W76004780                OPE /INCOR
     BATCH . TIME = 00:10:00/00:01:08  PAGES = 100/45
     CARDS = 100/0   SIZE = 16
   T/D  152100  072776
 RC TEST3
 0-TIMER .U DEF ACCT 491110  AER
   TEST3 .M   676W76004780                OPEN/INCOR
 0 E
     BATCH . TIME = 00:10:00/00:01:28  PAGES = 100/54
     CARDS = 100/0   SIZE = 8
   TIMER. START
   TEST3*TIMER STARTED
 0-TIMER*RV ONE 16N-SERVO:  RESPOND WITH SS/U
 II TIMER RC
   TIMER*  ID   TIME      SEQ  UPDATE ERR  RB     STATUS
   TIMER*TEST3  152116       5      2               IN DMR
 II TIMER DP
 FS 7/5
   7/5: UP
 RV 7/5
   7/5. RV
 0 07/5
    LOAD 000001 7/5 AUDIT-TRAIL1-1 TIMER
   PR1      INACTIVE
 II TIMER RC
   TIMER*  ID   TIME      SEQ  UPDATE ERR  RB     STATUS
   TIMER*TEST3  152116       5      2               IN DMR
 0-TIMER*TYPE IN NEXT REEL,S 6(SIX) CHARS NO.
 0 000002
   TEST3*000000
   TEST3. FIN
   TEST3*
 SM PR1 E
   PR1      INACTIVE
 T◆
   ACTIVE RUNS:  TIMER+
 II TIMER AS
    LOAD 000002 7/5 AUDIT-TRAIL1-2 TIMER
   CR1    I ACTIVE
   TEST3  START
 RC TEST3
   TEST3 .M   676W76004789                OPEN/INCOR
```

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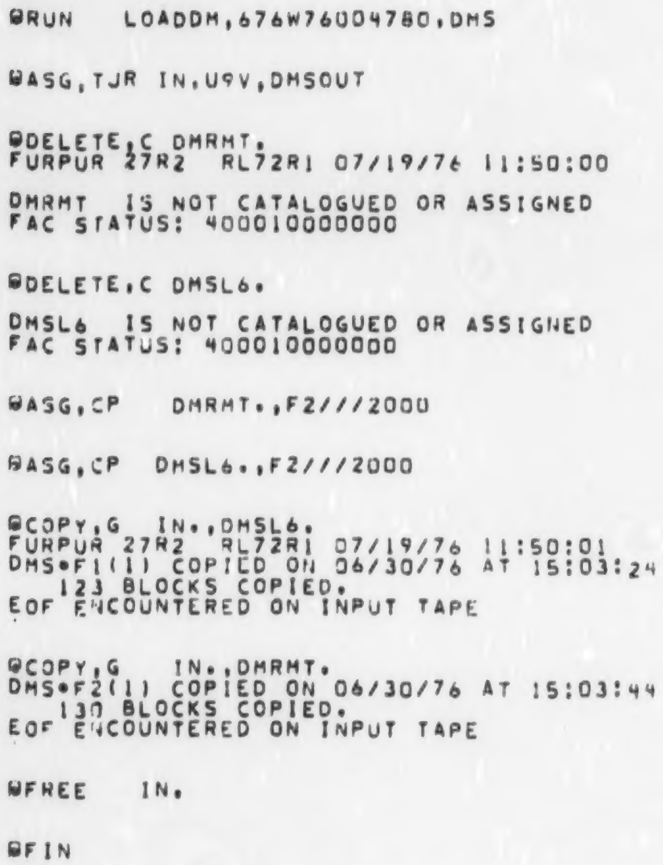
```
      CARDS = 1 0/0   SIZE = 32
  T♦
  . ACTIVE RUNS   TIMER+  TEST3+
  0-TIMER♦TYPE  N  EXT REEL,S 6(SIX) CHARS NO,
  0 000093
  RC TEST3
    TEST3 ,M   676W76004780               OPEN/INCOR
      BATCH   TIME = 00:10:00/00:00:59  PAGES = 100/25
      CARDS = 1 0/0   SIZE = 15
  II TIMER RC
    TIMER♦NO RU S ACTIVE IN DMR
  RC TEST3
    TEST3 ,M   676W76004780               OPEN/INCOR
      BATCH   TIME = 00:10:00/00:01:18  PAGES = 100/47
      CARDS = 100/0   SIZE = 34
  II TIMER RC
    T
  DMR
    TEST3♦000000
    TEST3  FI
    TESI3♦
  SM PR1 E
   .PR1      I ACTIVE
  T♦
    ACTIVE RUNS:  TIMER+
  II TIMER AF
  0-TIMER♦RELEASE DMS SERVO(S) S07/US   I TYPE C WHEN DONE
  C♦
  . C      KEY ERROR
  0 C
  T♦
    ACTIVE RUNS:  TIMER+
    CR1     I ACTIVE
    TEST3  START
   .T/D  152600  072776
  T♦
  . ACTIVE RUNS:  TIMER+  TEST3+
  RC TEST3
    TEST3 ,M   676W76004780               OPE /INCOR
      BATCH   TIME = 00:10:00/00:00:28  PAGES = 100/3
      CARDS = 100/0   SIZE = 32
  T♦
  . ACTIVE RUNS:  TIMER+  TEST3+
  RC TEST3
    TEST3 ,M   676W76004780               OPEN/INCOR
      BATCH   TIME = 00:10:00/00:00:56  PAGES = 100/23
      CARDS = 100/0   SIZE = 15
  RC TEST3
    TEST3 ,M   676W76004780               OPEN/INCOR
      BATCH   TIME = 00:10:00/00:01:08  PAGES = 100/45
      CARDS = 1 0/0   SIZE = 16
  T♦
    ACTIVE RUNS:  TIMER+  TEST3+
  II TIMER RC
  . TIMER♦ O RU S ACTIVE I  DMR
  RC TEST3
    TEST3 ,M   676W76004780               OPEN/INCOR
      BATCH   TIME = 00:10:00/00:01:27  PAGES = 100/54
      CARDS = 1  /0   SIZE = 5
  0-TIMER♦RV ON  16N SERVO:  RESPOND WITH SS/U
  II TIMER RC
    TIMER♦  ID    TIME     SEQ  UPDATE ERR  RB     STATUS
    TIMER♦TEST3  152704      5      2                IN DMR
  0  7/5
    LOAD 00000: 7/5 AUDIT♦TRAIL1♦2 TIMER
    TIME    OT ACTIVE
  II TIMER RC
    TIMER*  ID    TIME     S
    TEST3*000000
    TEST3  FIN
    TEST3*
  SM PR1 E
    PR1     INACTIVE
  T*
    ACTIVE RUNS!  TIMER*
  II TIMER RC
    TIMER*NO RUNS-ACTIVE I  DMR
  II TIMER EX
    TIMER  FI
  SQ*
    PR1        1 FILE      1 PAGES
    PR1     INACTIVE
    CR1     I ACTIVE
    TEST3  START
  T*
    ACTIVE RUNS!  TEST3*
  RC TEST3
    TEST3 ,M   676W76004780                 OPEN/I COR
      BATCH   TIME = 00:10:00/00:00:43  PAGES = 100/17
      CARDS = 100/0    SIZE = 31
  RC TEST3
    TEST3 ,M   676W76004780                 OPEN/INCOR
      BATCH   TIME = 00:10:00/00:01:00  PAGES = 100/27
      CARDS = 100/0    SIZE = 15
  RC TEST3
    TEST3 ,M   676W76004780                 OPEN/INCOR
      BATCH   TIME = 00:10:00/00:01:15  PAGES = 100/47
      CARDS = 100/0    SIZE = 24
  T*
    ACTIVE RU S!  TEST3*
  II TIMER RC
    TIMER   OT ACTIVE
  RC TEST3
    TEST3 ,M   676W76004780                 OPEN/INCOR
      BATCH   TIME = 00:10:00/00:01:27  PAGES = 100/54
      CARDS = 100/0    SIZE = 8
    TIMER  START
    TEST3*TIMER STARTED
  0-TIMER*RV ONE 14  SERVO!  RESPO D WITH SS/U
  0 07/5
     LOAD 000002 7/5 AUDIT-TRAIL1-2 TIMER
  II TIMER RC
    TIMER*  ID     TIME       SEQ  UPDATE ERR  RB      STATUS
    TIMER*TEST3  153003        5      2                 IN DMR
  II TIMER RC
    TIMER*  ID     TIME       SEQ  UPDATE ERR  RB      STATUS
    TIMER*TEST3  153003        5      2                 I  DMR
    TEST3*000000
    TEST3  FIN
    TEST3*
  SM PR1 E
    T/D  153100  072776
    PR1     INACTIVE
  0-TEST2  UNDEF ACCT 676W7600480   AER
  0 E
    TEST2  START
    CR1     INACTIVE
    TEST4  START
    TEST4
```



```
@RUN   LOADDM,676W76004780,DMS

@ASG,TJR IN,U9V,DMSOUT

@DELETE,C DMRMT.
FURPUR 27R2  RL72R1 07/19/76 11:50:00

DMRMT  IS NOT CATALOGUED OR ASSIGNED
FAC STATUS: 400010000000

@DELETE,C DMSL6.

DMSL6  IS NOT CATALOGUED OR ASSIGNED
FAC STATUS: 400010000000

@ASG,CP   DMRMT.,F2///2000

@ASG,CP  DMSL6.,F2///2000

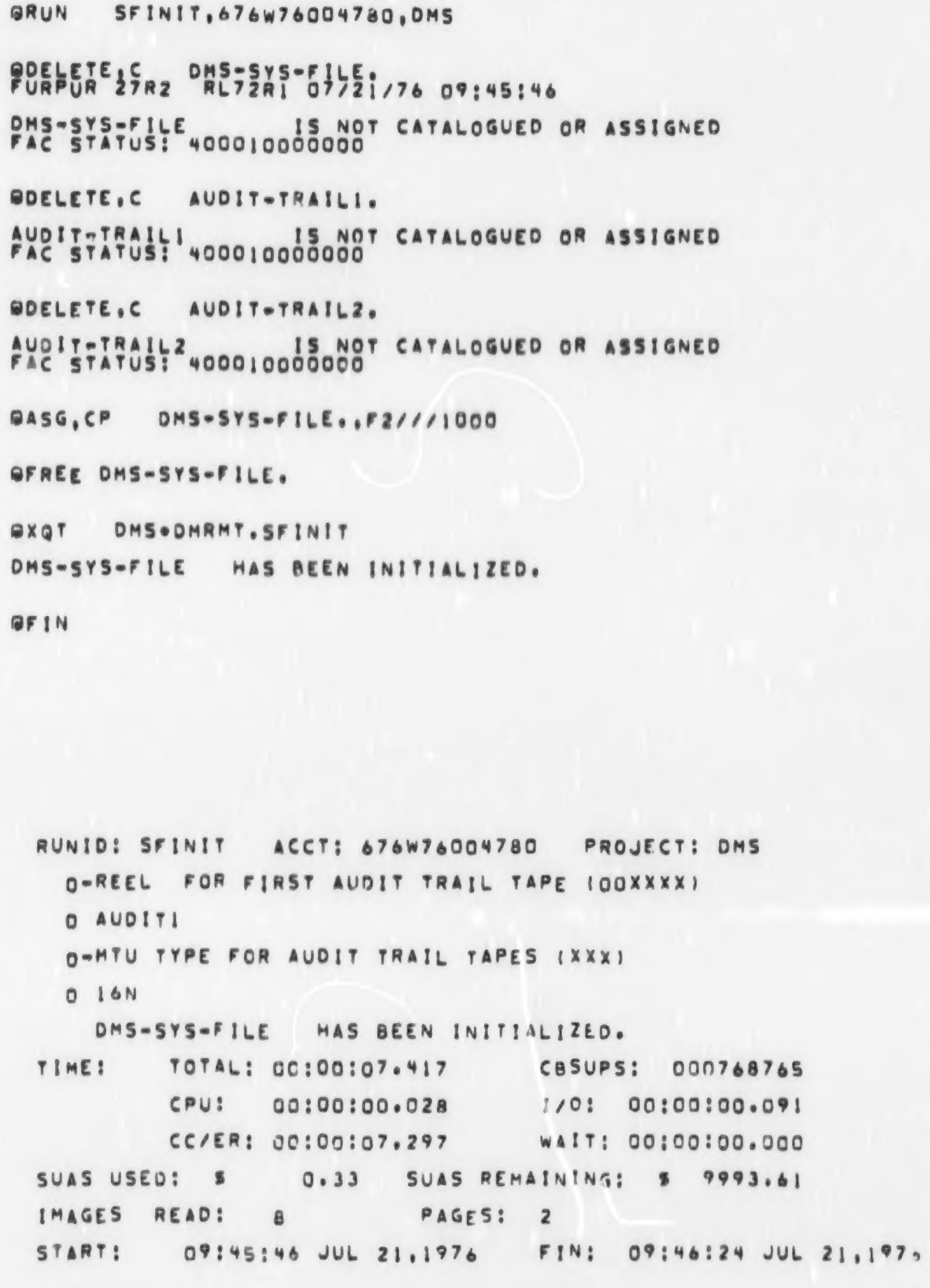
@COPY,G  IN.,DMSL6.
FURPUR 27R2  RL72R1 07/19/76 11:50:01
DMS*F1(1) COPIED ON 06/30/76 AT 15:03:24
   123 BLOCKS COPIED.
EOF ENCOUNTERED ON INPUT TAPE

@COPY,G   IN.,DMRMT.
DMS*F2(1) COPIED ON 06/30/76 AT 15:03:44
   130 BLOCKS COPIED.
EOF ENCOUNTERED ON INPUT TAPE

@FREE   IN.

@FIN
```

Figure 2.2



```
@RUN   SFINIT,676W76004780,DMS

@DELETE,C   DMS-SYS-FILE.
FURPUR 27R2  RL72R1 07/21/76 09:45:46

DMS-SYS-FILE         IS NOT CATALOGUED OR ASSIGNED
FAC STATUS: 400010000000

@DELETE,C   AUDIT-TRAIL1.

AUDIT-TRAIL1         IS NOT CATALOGUED OR ASSIGNED
FAC STATUS: 400010000000

@DELETE,C   AUDIT-TRAIL2.

AUDIT-TRAIL2         IS NOT CATALOGUED OR ASSIGNED
FAC STATUS: 400010000000

@ASG,CP   DMS-SYS-FILE.,F2///1000

@FREE DMS-SYS-FILE.

@XQT   DMS*DMRMT,SFINIT
DMS-SYS-FILE   HAS BEEN INITIALIZED.

@FIN
```

```
RUNID: SFINIT   ACCT: 676W76004780   PROJECT: DMS
  O-REEL  FOR FIRST AUDIT TRAIL TAPE (OOXXXX)
  O AUDIT1
  O-MTU TYPE FOR AUDIT TRAIL TAPES (XXX)
  O 16N
    DMS-SYS-FILE   HAS BEEN INITIALIZED.
TIME:    TOTAL: 00:00:07.417      CBSUPS:  000768765
         CPU:   00:00:00.028       I/O:  00:00:00.091
         CC/ER: 00:00:07.297      WAIT: 00:00:00.000
SUAS USED:  $     0.33   SUAS REMAINING:  $  9993.61
IMAGES  READ:   8          PAGES:  2
START:    09:45:46 JUL 21,1976    FIN:  09:46:24 JUL 21,197
```

Figure 2.3

```
@RUN   QLINIT,676W76004780,DMS

@DELETE,C   DMS*QUICK-LOOK1.
FURPUR 27R2  RL72R1 07/21/76 09:46:49

DMS*QUICK-LOOK1     IS NOT CATALOGUED OR ASSIGNED
FAC STATUS: 400010000000

@DELETE,C    QUICK-LOOK2.

QUICK-LOOK2  IS NOT CATALOGUED OR ASSIGNED
FAC STATUS: 400010000000

@ASG,CP    QUICK-LOOK1.,F2///100

@ASG,CP    QUICK-LOOK2.,F2///300

@FREE  QUICK-LOOK1.

@FREE  QUICK-LOOK2.

@ASG,A   QUICK-LOOK1.

@ASG,A   QUICK-LOOK2.

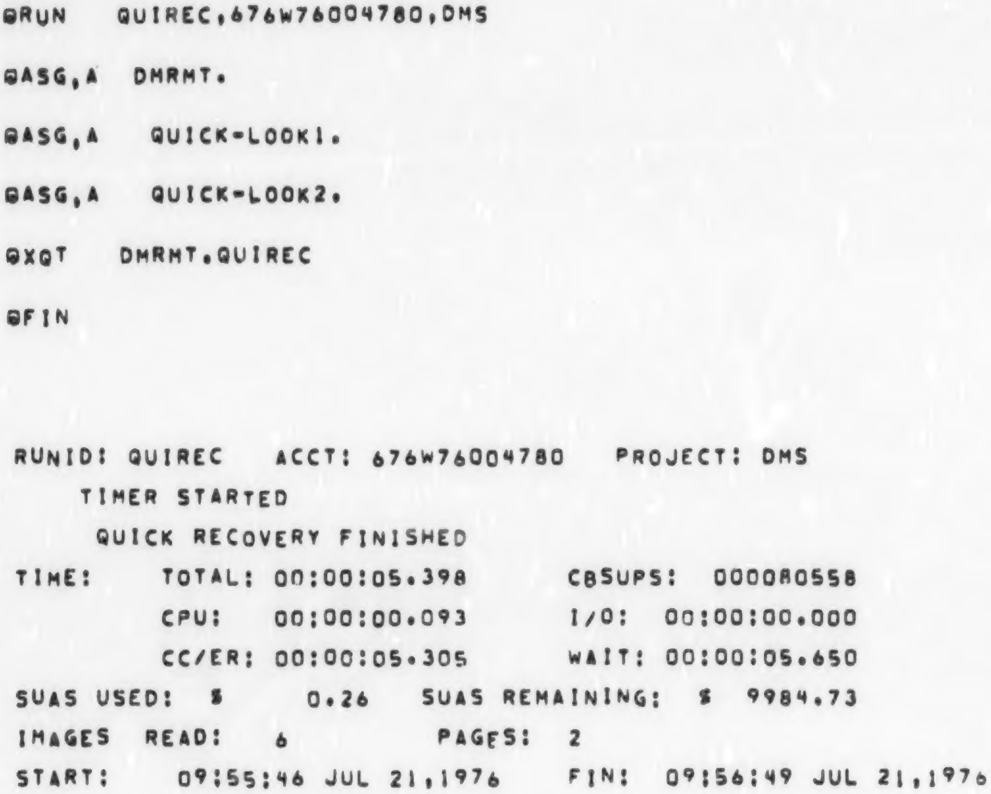
@ASG,A  DMRMT.

@XQT   DMS*DMRMT.QLINIT
ALL SEGMENTS OF THE QLF ARE INITIALIZED

@FIN

 RUNID: QLINIT   ACCT: 676W76004780   PROJECT: DMS
     ALL SEGMENTS OF THE QLF ARE INITIALIZED
 TIME:     TOTAL: 00:00:08.522      CBSUPS:  000392018
           CPU:   00:00:00.031      I/O:  00:00:00.115
           CC/ER: 00:00:08.376      WAIT: 00:00:00.000
 SUAS USED:  $     0.30   SUAS REMAINING:  $  9993.31
 IMAGES  READ:   12          PAGES:  2
 START:    09:46:48 JUL 21,1976    FIN:  09:46:55 JUL 21,1976
```

Figure 2.4



```
@RUN   QUIREC,676W76004780,DMS

@ASG,A  DMRMT.

@ASG,A   QUICK-LOOK1.

@ASG,A   QUICK-LOOK2.

@XQT   DMRMT.QUIREC

@FIN


RUNID: QUIREC   ACCT: 676W76004780   PROJECT: DMS
    TIMER STARTED
     QUICK RECOVERY FINISHED
TIME:    TOTAL: 00:00:05.398      CBSUPS:  000080558
         CPU:   00:00:00.093      I/O:  00:00:00.000
         CC/ER: 00:00:05.305      WAIT: 00:00:05.650
SUAS USED:  $     0.26   SUAS REMAINING:  $  9984.73
IMAGES  READ:   6          PAGES:  2
START:    09:55:46 JUL 21,1976    FIN:  09:56:49 JUL 21,1976
```

Figure 2.5

18

TESTING

1. II TIMER RC to obtain queueing reasons and run unit status,
2. II TIMER DP to dump IV02 and associated buffers,
3. II run-id or E run-id,
4. II TIMER DP, if possible,
5. II TIMER RC,
6. II TIMER DP, if possible,
7. X run-id, if necessary,
8. II TIMER DP, if possible,
9. II TIMER RC,
10. II TIMER DP, if possible,
11. II TIMER II,
12. RC TIMER,
13. X TIMER

If the run unit is terminated at step 3, then the remaining steps may be omitted. If the run unit is terminated at step 7, then TIMER must be II'd subsequently; consequently, continue through step 11. If TIMER does not terminate, then it must be X'd. In either case, the DMS system must be "re-started" (Reference: Recovery).

Use of Run Unit Keyins

If a run unit is hung in the DMR, then it must be terminated by one of the following:

1. II run-id
2. E run-id
3. X run-id

II run-id is used if CDBAPT=0. E run-id is used if the former fails or if CDBAPT=1. X run-id is used if either 1 or 2 fails, i.e. if the run unit stops getting time and pages and remains active.

Testing Under REP/CDB DMR

Once SFINIT and QLINIT have been executed, then DMS run units or TIP transactions may be initiated. If QUIREC was not executed, then the first DMS run unit or TIP transaction will start TIMER. And, if audit trail tapes are used, then an audit trail tape will be requested to be mounted and the next tape number will be requested.

Description of Console Keyins

1. II TIMER RC

   Command to display run unit status information; in particular, queueing reasons (Reference: Appendix D).

2. II TIMER DP

   Command to dump IV02 and associated buffers.

3. II TIMER EX

   Command to release DMS REP if no run units active in DMR and KDMR=1.

4. II TIMER II

   Command to terminate TIMER if runs active in DMR, in particular, if DMR is hung. This keyin should not be used unless absolutely necessary.

5. II TIMER AS

   Command to swap audit-trail tape.

6. II TIMER AF

   Command to free audit-trail tape and return tape unit to system

7. II run-id

   Command to terminate DMS run units. CDBAPT must be set to zero.

8. E run-id

   Command to terminate DMS run unit if CDBAPT=1.

Use of TIMER Keyins

If a run unit is hung in the DMR, then the user should issue the following:

9

RECOVERY

Recovery from Run Unit/DMR Abnormal Termination

The procedure to terminate a run unit is as follows:

1. If the DMSSGP parameter, CDBAPT=1, then a demand terminal user may issue an @@X TIO from his terminal to terminate the run unit. This procedure can be used to terminate a TIP transaction.

2. If the DMSSGP parameter, CDBAPT=0, then a demand terminal user may not terminate his run unit from the demand terminal. The run unit must be terminated from the system console with one of the following:

   a. II DMS run-id
   b. E run-id

3. Wait a few minutes to see if the run unit will terminate. Issue an RC run-id at repeated intervals. If time or pages increase, then continue to wait until the time and pages no longer increase. This wait can extend for some time. That is because, when a run unit is E'd, the DMR gains control and rolls back the run unit. The more updates the run unit has performed to the database, the longer it will take to roll it back and terminate.

4. If the run unit stops getting time and pages and remains active, issue an X run-id. The run unit should terminate.

5. If a DMS run unit is X'd, then an II TIMER II must be issued. Issue an RC TIMER. If time or pages increase, then continue to wait. TIMER must be allowed to dump the buffer plus all the DMR code before it exits.

6. If TIMER stops getting time and pages and TIMER remains active, issue an X TIMER. TIMER should terminate.

7. If the DMR terminated under an abnormal condition, e.g.

   II TIMER II

   then the DMS system must be "re-started" by:

   a. A Jump Key 4 boot or a RL DMR$
   b. Executing DMRCLEAR
   c. Executing QUIREC
   If audit trail tapes are used, then the next tape number will be requested.
   d. Restarting old DMS run units, or, if there are no run units to be restarted, starting new DMS run units.

8. Execute DMRCLEAR

```
ST DMS*DMRMT.DMRCLEAR,,,account number
```

Upon completion, DMRCLEAR will display the message:

"DMS AUTO-RECOVERY PERFORMED" and
"RUN UNIT CONTROL TABLE CLEARED. RESTART DMR"

DMRCLEAR will clear the indicators in the REPDMR for all active run units and set a flag so that TIMER will perform automatic buffer recovery. It is imperative that DMRCLEAR be executed following any abnormal DMR termination.

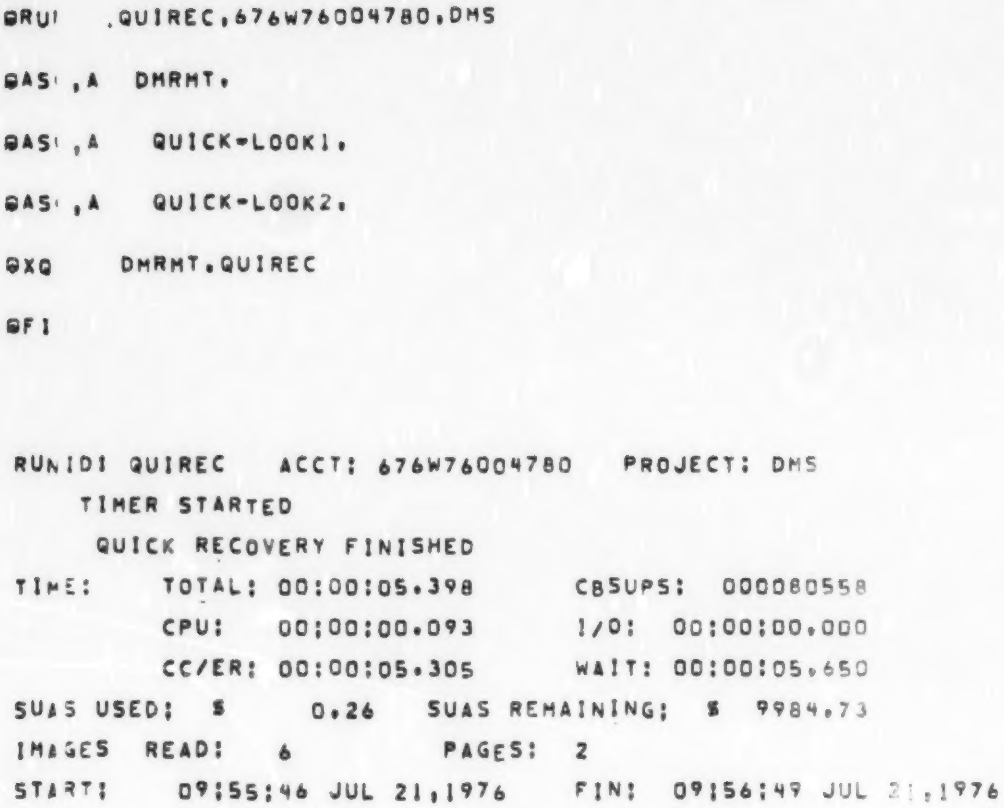
9. Execute QUIREC

Upon completion, QUIREC will display the message:

"QUICK-RECOVERY FINISHED"

QUIREC will initiate TIMER and then rollback any run units that were active when the DMR terminated. TIMER will request an audit trail tape and write a checkpoint on it after quick recovery has finished. It is imperative that QUIREC be executed <u>after</u> DMRCLEAR following any abnormal DMR termination.

10. On occasion it may be necessary to reload the DMR with an RL DMR$ (if CDB = ON) prior to executing DMRCLEAR and QUIREC.



```
@RUN   .QUIREC,676W76004780,DMS

@ASG ,A  DMRMT.

@ASG ,A   QUICK-LOOK1.

@ASG ,A   QUICK-LOOK2.

@XQ    DMRMT.QUIREC

@FIN


RUNID: QUIREC   ACCT: 676W76004780   PROJECT: DMS
    TIMER STARTED
     QUICK RECOVERY FINISHED
TIME:     TOTAL: 00:00:05.398      CBSUPS:  000080558
          CPU:   00:00:00.093      I/O:  00:00:00.000
          CC/ER: 00:00:05.305      WAIT: 00:00:05.650
SUAS USED: $     0.26   SUAS REMAINING: $  9984.73
IMAGES  READ:   6         PAGES:  2
START:    09:55:46 JUL 21,1976    FIN:  09:56:49 JUL 21,1976
```

Figure 4.1

Acknowledgements

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References

1. Sperry-Univac UP-7971
   DMS-1100 Operator Reference Manual
   1976

2. Sperry-Univac
   DMS-1100 Level 6R1 Release Bulletin
   1976

APPENDICES

DMR External Error Codes

II - 2 - 26 (a)

A

DMR ERROR CODES
AS OF 1 OCTOBER 1975

DMR EXTERNAL ERROR CODES

* - ERROR AREA, RECORD, OR SET PRESENT
T - TEST ON ERROR CODE
NN - REPRESENTS DML COMMAND AS INDICATED BELOW:

01	CLOSE	07	INSERT	14	IF
02	DELETE	08	MODIFY	15	IMPART
03	FIND/FETCH	09	OPEN	16	MOVE
04	FREE	11	REMOVE	17	LOG
05	GET	12	STORE	21	ACQUIRE
06	KEEP	13	DEPART		

TRU015		ERR CODE	ERROR CONDITION
6061	*	NN01	AREA NOT OPEN. TC01 IF CONDITION LEGITIMATELY EVALUATED AS FALSE. DC14
6062	*	NN02	AREA-KEYS VIOLATE WITHIN CLAUSE. TH20 IF ERROR-REC. NOT DEFINED IN SCHEMA AS OWNER/MEM. OF SET. DC14
6063		NN03	OCCURS DEPENDING ITEM COUNT IS OUT OF RANGE. DH34
6064		NN04	MAXIMUM OF 10 CALC KEYS EXCEEDED. DH39
6065	*	NN05	RECORD VIOLATES DUPLICATES NOT ALLOWED CLAUSE. DH39/DH50
6066	*	NN06	NO CURRENT REC OF AREA/REC/SET NAME. DC0302/DC0303/DC0305/DC0307/DC14/DH08
6067	*	NN07	END OF SET/AREA WHILE FINDING REC. DH0303/DC0307/DH08/DH38T. ALSO END OF PA OR SPA DURING ACQUIRE (21) COMMAND. DC21
6070	*	NN08	RECORD NOT DEFINED IN SET/AREA OR RECORD DOES NOT CONTAIN SPECIFIED KEYS. DC0303/DC0306/DC0307/DC11/DC35
6071	*	NN09	IMPROPER AREA USAGE. TH07
6160		NN10	INSUFFICIENT SPACE IN D$WORK FOR ALL AREAS/REC/SETS. TC1502
6161		NN11	RU IMPARTING E8 SCHEMA WHILE ANOTHER USING TIP SCHEMA, OR VICE VERSA. TC15

6162		NN12	BAD TIP FILE NUMBER FOR SCHEMA. TC15
6163	*	NN13	NO REC/SET OCCURRENCE SATISFIES CRITERIA. DC0303/DC0304/DC0305/DH03/DH19/DH36/DH38 DH39T NO CURRENT RECORD OF RUN UNIT. DC02/DC05/ DC07/DC08/DC11/DC14
6164		NN14	RECORD IS NOT CURRENTLY MANUAL MEMBER OF SET. DH21
6165		NN15	DELETE ONLY ATTEMPTED ON OWNER OF NON-EMPTY SET. DC02
6166	*	NN16	RECORD ALREADY MEMBER OF SET. DC07
6167		NN17	TOO MANY CHARACTERS IN RANDENTIAL CALC KEY. GS13
6170		NN18	TOO FEW CHARACTERS IN RANDENTIAL CALC KEY. GS13
6171	*	NN19	RECORD NOT DEFINED IN SCHEMA AS MANUAL MEMBER OF NAMED OR ANY SET. DC07/DC11
6260		NN20	CALCED PAGE NUMBER IS OUT OF BOUNDS. GS13
6261		NN21	RUN UNIT HAS NOT DONE AN IMPART. LINKER/ IV01
6262		NN22	RUN UNIT ID DUPLICATES ID FOR ACTIVE RUN UNIT. TC15
6263		NN23	ROLLBACK PARAGRAPH IS IN SUB-PROGRAM BUT IS NOT DEFINED AS AN ENTRY POINT. LINKER
6664		NN24	ATTEMPT MADE TO ACQUIRE FROM A SET WHERE SET MODE IS NOT PA OR SPA. DC21
6265		NN25	
6266		NN26	A/R/S REV.LIST FULL-NOT ENOUGH TRL SPACE. TH02/TH09T
6267		NN27	A/R/S REF.TBL.NOT FOUND, EMPTY TRL SLOT PASSED. TH02/TH09T
6270	*	NN28	AREA ALREADY OPENED BY THIS RUN UNIT. TC09
6271		NN29	OPEN (NOT FOR INITIAL LOAD) ON PARTIALLY INITIALIZED AREA. TC09

6360		NN30	NO SPACE IN ILLPR TBL. FOR NEW ENTRY (MAKE NUMBIL). TC09
6361		NN31	NOT ENOUGH ROLLBACK BUFFER SPACE FOR PAGES IN AREA. TC09
6362		NN32	ENTRY PT. TO CALC PROCEDURE NOT CORRECT. DH36
6363		NN33	TBL. OR PAGE SPACE REQUEST LARGER THAN SYSTEM BUFFER. CA01 INVALID REQUEST HAS BEEN MADE. CA01 GATHER WRITE REQUEST TO AUDIT TAPE WITH DATA LENGTH GREATER THAN SYSTEM BUFFER. GWBUFF, SIZE. RR01
6364	*	NN34	TIP AREA CANNOT BE ASSIGNED OR EXEC 8 AREA DOES NOT HAVE UNIVERSAL QUALIFIER. TC09
6365	*	NN35	INVALID PAGE/REC. NUM. PASSED IN DIRECT AREA KEY. DC0301/DH35/DH38
6366		NN36	INVALID PAGE/REC. NUM. PASSED IN CALC AREA KEY. DH36
6367		NN37	DATA-NAME VALUE FOR UPPER OR LOWER PAGE BOUND OUTSIDE LIMITS OF AREA OR IS AN OVERFLOW PAGE. DH40
6370		NN38	SECOND IMPART MADE WITHOUT DOING A DEPART. LINKER
6371		NN39	FACILITY REJECT ASSIGNING PRT. ARRAY SCRATCH SORT FILE. DH23
6460		NN40	OPENING INITIAL LOAD MORE P.A. AREAS THAN SPECIFIED IN DML SCHEMA SECTION - NO SPACE IN D$WORK. DH23
6461		NN41	CLOSING P.A. AREA AS THOUGH IT WAS OPEN INITIAL LOAD WHEN IT WAS NOT. DH24
6462	*	NN42	TOO FEW POINTERS RESERVED IN RECORD. DC07
6463		NN43	ERROR ON FREE OF INTERNAL SCRATCH SORT FILE OF POINTER ARRAY ENTRIES DURING INITIAL LOAD. DH24
6464		NN44	STORING OR INSERTING RECORD INTO A POINTER AREA AS THOUGH IT WAS OPEN INITIAL LOAD WHEN IT WAS NOT. DH25

6465	NN45	OPENING P.A. AREA INITIAL LOAD + NONE SPECIFIED IN DML SCHEMA SECTION. DH23
6466	NN46	ILLEGAL ACCESS DIRECTLY OF POINTER OR INDEX AREA. DC0303
6467	NN47	ERROR ASSIGNING P.A. INITIAL LOAD WORKING STORAGE FILE (ILPAWS-USED FOR I.L. RECOVERY ONLY). DH23
6468	NN48	POINTER ARRAY BUFFER NOT SET-UP WHEN DOING OPEN. DH23
6471	NN49	INSUFFICIENT SPACE IN D$WORK FOR # INITIAL LOAD POINTER AREAS SPECIFIED IN DML SCHEMA SECTION. TC15
6560	NN50	I/O ERROR FROM P.A. INITIAL LOAD WORKING STORAGE FILE (ILPAWS-USED FOR I.L. RECOVERY ONLY.) DH23
6561	NN51	ITEM NAMES ON MODIFY REFER TO CURRENT REC. OF R.U. - SHOULD REFER TO ITS OWNER
6562	NN52	AREA/RECORD/SET NOT INVOKED BY RUN UNIT. TH05/TH08/DH09T TC15/TH09/TH15/CA02
6563	NN53	INSUFFICIENT SPACE IN PAGE USAGE TBL. FOR ANOTHER ENTRY. DH01
6564	NN54	ATTEMPT WAS MADE TO WRITE LESS THAN 1 WORD TO AUDIT TRAIL TAPE. TC17
6565	NN55	AN ALIAS 'OF' IS PRESENT WHEN IT SHOULD BE ALIAS 'FOR' - USED IN INDEX SEQ. DH11
6566	NN56	REC/SET NAME FOR GENERALIZED COMMAND NOT DEFINED IN DML PROGRAM. TH17
6567	NN57	DATA-NAME SPECIFIED IN SCHEMA NOT FOUND IN RUN UNIT WORKING STORAGE. TH03
6570	NN58	CURRENT OF RUN UNIT IS NOT OF THE SPECIFIED TYPE. DC02
6571	NN59	ATTEMPT MADE TO ACQUIRE FROM A SPA SET WHILE THE OWNER IS CURRENT, OR WITHOUT THE 'USING DEFINED KEY' CLAUSE PRESENT IN THE COMMAND SYNTAX. DC21
6660	NN60	REC. WHICH WAS USED AS STARTING POINT IN SET OCCURRENCE NOT FOUND AFTER SEARCHING AROUND SET-IT WAS DELETED. DH28

6661	NN61	DBK SPECIFIED AS THE 'BEGINNING AT' DBK WAS NOT FOUND IN THE POINTER ARRAY OR SORTED POINTER ARRAY. DC21
6662	NN62	SAME AREA/RECORD/SET NAME USED IN 2 OR MORE SCHEMAS. TH09
6663	NN63	BAD BLOCK TYPE HEADER FOR LOG COMMAND. TC17
6664	NN64	NUMBER WORDS TO WRITE RDA LENGTH. TC17
6665	NN65	ATTEMPTING LOG COMMAND + DMR HAS NO AUDIT TAPE (ATT = 0). TC17
6666	NN66	ATTEMPTING CHECKPOINT + DMR HAS NO AUDIT TAPE (ATT = 0). IV09
6667	NN67	ATTEMPT MADE TO ACQUIRE A NEGATIVE NUMBER OF DBK'S. DC21
6670	NN68	ATTEMPT MADE TO ACQUIRE MORE DBK'S THAN THERE IS SPACE ALLOCATED FOR IN THE ACQUIRE-LIST. DC21
6671	NN69	SCHEMA NAME IN SCHEMA NOT = SCHEMA NAME IN DCMA. TC15
6760	NN70	NO UPDATE LINKS ALLOCATED IN SCHEMA FOR INDEX SEQ. DH43
6761	NN71	INDEX SEQUENTIAL KEY SEQUENCE ERROR. DH42
6762	NN72	INDEX AREA FULL. DH42
6763	NN73	NOT ALLOWED TO OPEN INDEX AREA IN UPDATE MODE. TC09
6764	NN74	ATTEMPT TO MODIFY I.S. KEYS OF A RECORD DURING INITIAL LOAD MAKING THEM HIGHER THAN ANY CURRENTLY IN INDEX. DH43
6765	NN75	ATTEMPT TO MODIFY OR DELETE LATEST STORED I.S. RECORD DURING INITIAL LOAD. DH45
6766	NN76	MAXIMUM NUMBER OF INDEX LEVELS (30) EXCEEDED. DH42
6767	NN77	NO INDEX SEQUENTIAL RECORDS STORED DURING INITIAL LOAD. DH43
6770	NN78	SCHEMA CANNOT BE ASSIGNED OR DOES NOT HAVE UNIVERSAL QUALIFIER. TC15

6771	NN79	AREA CANNOT BE ASSIGNED. I002
7060	NN80	RECOVERABLE I/O ERROR. TC15/DH01/I002
7061	NN81	DATABASE KEY FOR STORE DIRECT ALREADY IN USE, DH35/DH38T
7062	NN82	D$WORK CONTAINS INCONSISTANT INFORMATION, MAY BE PRE-PROCESSOR ERROR. DC05, TH03, TH06
7063	NN83	
7064	NN84	NO SPACE ON PAGES SPECIFIED FOR RECORD. DH40, DH10
7065	NN85	REC. INVOKED BUT NOT COPIED BY DML PROGRAM. TH03
7066	NN86	
7067	NN87	AREA-NAME VIOLATES WITHIN CLAUSE FOR STORING RECORD. TH20
7070	NN88	CALC PROCEDURE NOT IN SEGMENT LOAD TABLE. DH36
7071	NN89	RECORD FOUND WITH DIRECT LOCATION MODE NOT CORRECT TYPE. DH35
7160	NN90	USER ATTEMPTED TO USE LEVEL 6 DMR IN CONJUNCTION WITH A SCHEMA THAT WAS BUILT USING A DDL THAT IS OF PRE-LEVEL 6 VINTAGE. TC15
7161	NN91	
7162	NN92	DATABASE KEY FOUND VACANCY ENTRY (DELETED RECORD). DH14
7163	NN93	DATABASE KEY FOUND VACANT HEAD OF SAME-KEY LIST. DH14/DH38T
7164	NN94	INITIAL LOAD ERROR DURING SORT OF PTR. ARRAY ENTRIES. DH17
7165	NN95	INSUFFICIENT SPACE IN POINTER ARRAY AREA. DH17
7166	NN96	NO SPACE ON PAGE. DH18/DH37/DH39/DH40/ DH39T/DH40T
7167	NN97	RECORD NO. SPECIFIED OR GENERATED NOT USABLE ON PAGE. DH37/DH03
7170	NN98	INVALID AREA CODE/PAGE NUMBER IN DATA-BASE KEY. DH01/I001
7171	NN99	SCHEMA FILE NOT FOUND. TC15

Run Unit Rollback Error Codes

B

RUN UNIT ROLLBACK ERROR CODES

TRUO10	ERR CODE	ERROR CONDITION
6061	01	USER ERROR AND COMMAND QUICK B/L'S NOT PUT IN SAVE DATA CLAUSE IVO3/DHO1/IOO2
6062	02	DEADLOCK BETWEEN RUN UNITS. GSO1/HSO3
6063	03	INTERNAL DMR ERROR. IVO1/GSO7/RRO5
6064	04	CONTINGENCY IN COBOL PROGRAM AND NO USER CONTINGENCY ROUTINE. LINKER
6065	05	LONG RECOVERY IN PROGRESS. IVO1
6066	06	NOT ENOUGH QUICK-LOOK FILE SPACE ALLOCATED. DHO1
6067	07	TIP QUICK LOOK FILE NOT ASSIGNED, OR EXEC8 QLF DOES NOT HAVE UNIVERSAL QUALIFIER. IVO1
6070	08	CAME INTO TIMER WITHOUT TIMER-ID. IVO2
6071	09	II KEYIN FROM CONSOLE WHILE RUN-UNIT IN DMR. LINKER
6160	10	NOT ENOUGH SPACE FOR PKT IN AUDIT TRAIL WRITE TABLE. RRO1
6161	11	ANOTHER RU RECEIVED I/O ERROR WRITING THIS RU'S PAGE. IOO2
6162	12	ERROR IN STARTING TIMER USING CSF$-@START DMRT.TIMER. IVO1
6163	13	QUICK RECOVERY IN PROGRESS. IVO1
6164	14	TRYING TO ACCESS A 'DOWNED' AREA. TCO9/DHO1/DCO2/DCO7/DC12/DH45.
6165	15	SEGMENT-FILE CANNOT BE ASSIGNED OR DOES NOT HAVE UNIVERSAL QUALIFIER. IVO1
6166	16	DIRECT = O AND TRYING TO FIND OR STORE RECORDS WHOSE LOCATION MODE IS DIRECT. DH35/DH38
6167	17	CALC = O AND TRUING TO FIND OR STORE RECORD WHOSE LOCATION MODE IS CALC. DCO2/DH22/DH36/DH39.

6170	18	VIA SET = 0 AND TRYING TO STORE RECORD WHOSE LOCATION MODE IS VIA SET, MODE CHAIN. DH40
6171	19	PASET = 0 AND TRYING TO FIND OR STORE RECORD WHOSE LOCATION MODE IS VIA SET, MODE POINTER ARRAY. DC02/DC07/DC08/DC11 DC12/DH05/DH17/DH19/DH20/DH23/DH24/DH25/DH2[illegible]/ DH28/DH40/TC09/TC14/TC15
6260	20	INDSEQ = 0 AND TRYING TO FIND OR STORE RECORD WHOSE LOCATION MODE IS INDEX SEQUENTIAL. DH42/DH43/DH45/DH46
6261	21	GENCOM = 0 AND TRYING TO USE GENERALIZED COMMANDS. TH04/TH15/TH17
6262	22	DMR NOT CONFIGURED FOR DMR ELEMENT ROUTINE CALLED. IV03
6263	23	USER MUST RESTART POINTER ARRAY INITIAL LOAD. DH23
6264	24	CONTINGENCY OCCURRED IN UTILITY PROCESSOR. LINKER
6265	25	I/O ERROR WRITING TO DATABASE ON COMMAND ROLLBACK, RU ROLLBACK WAS DONE.
6266	26	ATTEMPT WAS MADE TO EXECUTE SPA CODE WITH SPA SWITCH NOT TURNED ON. DH27/DH28/DH29/DH43
6267	27	ATTEMPT WAS MADE TO EXECUTE ACQUIRE COMMAND WITH PASETS++SPA SWITCH NOT ON. DC21
6270	28	ATTEMPT WAS MADE TO EXECUTE FORTRAN CONVERSION CODE WITH FORTRAN SWITCH NOT TURNED ON IN DMSSGP. TH03,TH06
6271	29	HALT RUN UNIT LAG IS SET, CANNOT IMPART. IV01
6360	30	DBA CONTROL TERMINAL IS IN CONTROL, CANNOT START TIMER. IV01
7171	99	NO ROOM IN REGISTER SAVE AREA IN D$WORK FOR GS09. GS09
6361	31	USING MULTIPLE SCHEMAS AND NUMBER OF BITS USED FOR AREA CONTROL IN THIS SCHEMA DIFFERS FROM THAT OF SCHEMA ALREADY IMPARTED. TC15/TH09

DMR Internal Error Codes

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C

DMR INTERNAL ERROR CODES

TRU15 ERR CODE	ERROR CONDITION
0001	ILLEGAL COMMAND. IV01
0002	RECORD ENTRY ON PAGE WITH NO SLOT. DH19
0003	ALIAS DATA-NAME DOES NOT MATCH LOCATION MODE DATA-NAME. DH35
0004	RECORD DEFINED AS MEMBER OF SET IN SDT BUT NOT IN RDT. DC02
0005	NO 'OCCURS DEPENDING' ITEM FOUND IN RDT BUT DDL SPECIFIED. DH34
0006	NO RECORD CURRENCY TABLE ENTRY AVAILABLE FOR NEW RECORD CURRENCY LOCK. ONLY ONE RCT ENTRY CAN BE ALLOCATED PER RUN UNIT. DH30
0007	RECORD CURRENCY TABLE ENTRY TO BE RELEASED IS NOT LINKED TO PROPER BUT ENTRY. DH52
0010	INSUFFICIENT SPACE IN INVOKE TABLE FOR IPA RECORD ENTRY. TC15
0011	USAGE, FORMAT OR LENGTH PARAMETER MISSING IN RDT. DH12/DH13
0012	RECORD CODE DOESN'T MATCH MEMBER CODE IN SDT. DH19/DH50
0013	DBK IS DEFINED AS SORT KEY BUT NO OBJECT RECORD GIVEN. DH50
0014	NO. ALIAS DATA-NAMES - NO. SORT KEYS FOR OBJECT RECORD. DH50
0015	NO. SORT KEYS RECORD1 - NO. SORT KEYS FOR RECORD2. DH50
0016	AREA NOT PREVIOUSLY INITIALIZED OR PAGE REQUESTED IS NOT THE PAGE RETURNED. IO02
0017	UNDEFINED POINTER LINKAGE IN RDT. DH21
0020	THE COUNT OF THE NUMBER OF AREAS OPEN FOR INITIAL LOAD WITH DYNAMIC PAGE INITIALIZATION, (FROM TRU016), WAS FOUND TO BE INCORRECT DURING COMMAND ROLLBACK. IV03

0021	ATTEMPT MADE TO ACTIVATE QUEUED RUN UNIT BUT NONE WAS FOUND. GS03
0022	MAXIMUM NUMBER OF RUN UNITS ARE ALREADY ACTIVE. IV03
0023	SCHEMA FILE IS BAD OR ELSE BAD INFORMATION WAS STORED INTO RDT/SDT. TH02
0070	CONTRADICTION-RECORD INDEX SLOT HAS FOREIGN REC. AND ADDRESS DISPLACEMENT. DH14
0071	POINTER FOUND DELETED RECORD (NOT HEAD OF SKL). DH14
0072	SEARCH FOR FOREIGH RECORD ON OVERFLOW FAILED. DH14
0074	SYS GEN HIARCHY EXCEEDED IN BUILDING A PATH. DH19
0075	LOC. MODE OF RECORD IN SDT IS UNDEFINED. DH19, DC12
0076	DUPS ALLOWED ON INTERMEDIATE LEVEL IN HIARCHY. DH19
0100	SET ORDER NEXT OR PRIOR BUT SOS IN LOC. MODE OF OWNER. DH19
0101	ALIAS CLAUSE ON RECORD NOT IN A SORTED SET. DH19
0103	HIGHER OWNER AREA CONSTRICTING MEMBER RECORD PLACEMENT NOT FOUND IN OWNER RDT. DH40
0104	RECORD HAS INTERVAL CLAUSE BUT NO WITHIN LIMITS CLAUSE, DH40
0106	NOT ENOUGH SPACE IN LAST RECORD INTERVAL TABLE. DH40
0107	AREA CODE FOR L.R.I. TBL. RECORD NOT IN RDT WITHIN CLAUSE. DH40
0110	SET ORDER NOT SORTED - RECORD RECEIVED DOES NOT MATCH RECORD CODE IN PATH. DH19
0111	EMPTY SET - IN ASKING FOR NEXT OR PRIOR - GOT OWNER. DH19
0112	RECORD INTERVAL CLAUSE DOESN'T AGREE WITH DLL ALLOCATE 'EVERY' CLAUSE. DH40

0113	UNRECOVERABLE I/O ERROR RECEIVED. DH01/I002
0114	DELETED RECORD VIA PATH HIERARCHY BUT COULD NOT GET BACK TO TOP OF HIARCHY AFTER DELETE. DC02
0115	RECORD FOUND VIA SET LOGIC NOT DEFINED AS MEMBER OF PROPER SETS. DC02/DH21
0116	DEALLOCATED 011 MIS. SPACE ADD. NOT FOUND IN D$WORK. CA02
0117	RECORD SLOT CANNOT BE FOUND. DH05, DH09, DH43, DH45
0120	NO SPACE FOR MISC. SPACE ADD. LEFT IN D$WORK. CA02
0121	REC. TYPE TO BE RESTORED ON ROLLBACK FROM D$WORK TO LRI TBL NOT FOUND. IN LRI TBL. TC13
0122	INTERNAL ERROR STATUS FOR RR05 THAT NOT ENOUGH CORE SPACE IS AVAILABLE FOR ROLLBACK. CA01
0123	QUICK LOOK FILE ENTRY FOR R.U. NOT FOUND IN QLSEG TABLE. RR05
0124	ROLLBACK BUFFER SIZE TO SMALL. RR05
0125	RUN UNIT THAT ALTERED PAGE NOT FOUND BUT STILL ACTIVE. RR05, I002

ERRORS 0126 THRU 0141 CAN BE ENCOUNTERED ONLY DURING INITIAL LOAD OF POINTER ARRAY SETS AND COMES FROM THE RANDOM FILE SORT PACKAGE VIA DH17.

0126	TRYING TO OPEN CHAIN CONTROL TABLE
0127	ILLEGAL RANDOM FILE PACKAGE OPERATION. DH17
0130	OUTPUT CHAIN IS NOT EMPTY. DH17
0131	RANDOM FILE PACKAGE ERROR, A2 = CODE. DH17 037 = EXEC I/O ERROR 041 = FILE ALREADY OPEN (RFPO$) 042 = ILLEGAL OPERATION CODE (RFPO$) 043 = CHAIN IS NOT EMPTY (RFPO$ FOR OUTPUT) 044 = FILE IS NOT OPEN FOR WRITING (RFPW$) 045 = FILE IS NOT OPEN FOR READING (RFPR$) 046 = READ FILE NOT OPEN 047 = FASTRAND POOL EXHAUSTED (RFPO$,RFPW$)

0132	WRONG TYPE RANDOM FILE PACKAGE I/O REQUESTED. DH17
0133	CHAIN NOT OPEN FOR WRITING. DH17
0134	CHAIN NOT OPEN FOR READING. DH17
0135	TRIED TO READ PAST END OF P.A. INITIAL LOAD SORT FILE. DH17
0136	TRIED TO CLOSE A CHAIN THAT IS NOT OPEN. DH1
0137	DESTRUCTIVE READ (I.E. CHAIN CLOSED TOO EARLY AND SPACE BECOMES AVAILABLE TO ANOTHER CHAIN AFTER READINT IT). DH17
0140	ZERO ITEM LENGTH FOR PTR. TO BE STORED IN P.A. SORT FILE. DH17
0141	I/O ERROR IN RANDOM FILE PACKAGE, A2 = I/O ERROR CODE. DH17
0142	PAGE ENTRY NOT FOUND IN BUT TBL. AFTER IT WAS JUST READ. TC01
0143	I/O ERROR READING SEGMENT FILE. GS12
0144	P.A. PART SELECTED TO CONTAIN OBJECT DBK CONTAINS NO DBK HIGHER THAN OBJECT DBK AND IS NOT LAST PART. DH05
0145	ATTEMPTED TO QUEUE RU BUT RU IS THE ONLY ONE ACTIVE, PROBABLE CAUSE = TOO SMALL TABLE BUFFER. GS02
0146	UNABLE TO REGISTER OR DEREGISTER. TRMRG$
0147	UNABLE TO QUEUE ASYNCHRONOUS CONTINGENCY FOR RUN UNIT.
0150	NO PRIOR/NEXT IN RECORD WHERE THEY SHOULD EXIST. DH29
0151	INVALID COMMAND FOR DH29. DH29
0152	PAGE FOUND IN BUFFER FOR WHICH NO REFERENCE TABLE EXISTS. CA02
0153	PA OR SPA CONTAINS NO DBK'S. DC21
0154	OBJECT RECORD DBK IS NOT WITHIN THE RANGE OF DBKS CONTAINED IN THE SPA. DH29
0155	GS12 DETECTED A CASE IN WHICH A ROUTINE IN SOME SEGMENT OTHER THAN THE MAIN SEGMENT CALLED A ROUTINE IN THE MAIN SEGMENT WHICH THEN CALLED A ROUTINE IN A THIRD SEGMENT. THIS VIOLATES SEGMENTATION RULES. GS12

Queueing Reasons In The DMR

II-2-38

D

Queueing Reasons in the DMR

1. Core not available (tables)
2. Core not available (pages)
3. Area locked out
4. LRI entry locked out
5. List entry not available
6. Page unavailable (usage lock wanted) because:
   a. old page locks on page
   b. core locks on page - other RU's
   c. alter lock on page - other RU's
7. Page being read (waiting for completion of I/O)
8. Page locked (wanting a core lock)
9. Record held as current - other RU's (update RU wants currency)
10. Page locked out by core allocation
11. RU is in rollback and cannot get core
12. Core not available (TIP pages)
13. Queued on overlay
14. Queued on a particular segment
15. Record held current by update run unit
16. Record currency locks on page by other RU's (wants usage lock)
17. Run unit attempting to open for update the first time and a checkpoint has been requested. Queueing done only if CKPT6 = ON

II TIMER RC Keyin

An II TIMER RC keyin may be utilized to display the current status of active run units within the DMR. For each run unit, the following information is displayed on the system console: (Reference: Examples, Page D-3 to D-5).

a. run unit identification
b. impart time
c. command sequence number
d. number of page updates
e. error code
f. rollback code
g. status in the DMR

The run unit will be either: (Reference: Queueing Reasons, Page D-1)

a. IN DMR
b. Queued on XX, where XX is an integer from 1 to 17

```
   VICKI/S25145 START
 RV 7/2
   T/D  132706  040776
   7/2  RV
 0 07/2
    LOAD 000001 7/2 AUDIT-TRAIL1-1 TIMER
 T◆
   ACTIVE RUNS:  TEST3+  TIMER+  VICKI+/S25145
 II TIMER RC
 0-TIMER*TYPE IN NEXT REEL.S 6(SIX) CHARS NO.
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB      STATUS
   TIMER*TEST3  132648       24     31                  IN DMR
 0 000002
 T◆
   ACTIVE RUNS:  TEST3+  TIMER+  VICKI+/S25145
   TEST3  MAX - PAGES
 II TIMER RC
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB      STATUS
   TEST3  FIN
   TIMER*TEST3  132854       67     11              QED  ON  5
   TIMER  FIN
   TEST3*        START QUICK RECOVERY
   TEST3*030000
   PR2     INACTIVE
   TEST3*
    LOAD SCR 7/3 IN -1 VICKI
    LOAD 94777 7/4 OUT -1 VICKI
   T/D  133206  040776
   PR1     INACTIVE
 0-CR1    INTERLOCK ERROR   AET
   QUIREC START
   TIMER  START
   QUIREC*TIMER STARTED
   TIMER*DMS AUTO-RECOVERY PERFORMED
 1-TIMER*RV ONE 16N SERVO:  RESPOND WITH SS/U
 0 E
   CR1    INACTIVE
 FS 7/2
   7/2  RV
 1 07/2
   TIMER*IF SYSTEM WENT DOWN WHILE DMR WAS ACTIVE,
 0-TIMER*PUT EOF ON  000001 AND REWIND. ANSWER C WHEN DON
 0 C
    LOAD 000001 7/2 AUDIT-TRAIL1-1 TIMER
 T◆
   ACTIVE RUNS:  VICKI+/S25145  QUIREC+  TIMER+
   T/D  133706  040776
 0-TIMER*TYPE IN NEXT REEL.S 6(SIX) CHARS NO.
   QUIREC* QUICK RECOVERY FINISHED
   QUIREC FIN
   TIMER*CHECKPOINT AT       4/ 7/76 13:37:16  NO.      1
   PR1     INACTIVE
 T◆
   ACTIVE RUNS:  VICKI+/S25145  TIMER+
   CR1     INACTIVE
   TEST1  START
 T◆
   ACTIVE RUNS:  VICKI+/S25145  TIMER+  TEST1+
 RC TEST1
   TEST1 .M   676*76004T20             OPEN/INCOR
     BATCH   TIME = 00:10:00/00:00:15  PAGES = 100/2
     CARDS = 100/0   SIZE = 32
 II TIMER RC
   TIMER*NO RUNS ACTIVE IN DMR
 RC TEST1
```

D-3

```
    PR1      INACTIVE
  RC TEST4
    TEST4 .M    676W76000480                OPEN/INCOR
      BATCH   TIME = 00:10:00/00:02:38  PAGES = 100/77
      CARDS = 100/0    SIZE = 11
  RC TEST1
    TEST1 .M    675W76004780                OPEN/INCOR
      BATCH   TIME = 00:10:00/00:00:49  PAGES = 100/7
      CARDS = 100/0    SIZE = 32
  RC TEST1
    TEST1 .M    676W76004780                OPEN/INCOR
      BATCH   TIME = 00:10:00/00:00:58  PAGES = 100/7
      CARDS = 100/0    SIZE = 32
  II TIMER RC
    TIMER*  ID     TIME       SEQ  UPDATE ERR  RB      STATUS
    TIMER*TEST2  110523        90     572  79  01       IN DMR
    TIMER*TEST4  110553         6       1      02       IN DMR
  RC TEST1
    TEST1 .M    676W76004780                OPEN/INCOR
      BATCH   TIME = 00:10:00/00:01:33  PAGES = 100/54
      CARDS = 100/0    SIZE = 16
  RC TEST1
    TEST1 .M    676W76004780                OPEN/INCOR
      BATCH   TIME = 00:10:00/00:01:48  PAGES = 100/60
      CARDS = 100/0    SIZE = 34
  II TIMER RC
    TIMER*  ID     TIME       SEQ  UPDATE ERR  RB      STATUS
    TIMER*TEST2  110523        90     572  79  01       IN DMR
    TIMER*TEST4  110553         6       1      02       IN DMR
  II TIMER RC
    TIMER*  ID     TIME       SEQ  UPDATE ERR  RB      STATUS
    TIMER*TEST2  110523        90     572  79  01       IN DMR
    TIMER*TEST4  110553         6       1      02       IN DMR
    TIMER*TEST1  112156         2                       IN DMR
  II TIMER RC
    TIMER*  ID     TIME       SEQ  UPDATE ERR  RB      STATUS
    TIMER*TEST2  110523        90     572  79  01       IN DMR
    TIMER*TEST4  110553         6       1      02       IN DMR
    TIMER*TEST1  112156         2                       IN DMR
  II TIMER RC
    TIMER*  ID     TIME       SEQ  UPDATE ERR  RB      STATUS
    TIMER*TEST2  110523        90     572  79  01       IN DMR
    TIMER*TEST4  110553         6       1      02       IN DMR
    TIMER*TEST1  112156         2                       IN DMR
  RC TEST1
    TEST1 .M    676W76004780                OPEN/INCOR
      BATCH   TIME = 00:10:00/00:02:03  PAGES = 100/67
      CARDS = 100/0    SIZE = 7
  II TIMER RC
    TIMER*  ID     TIME       SEQ  UPDATE ERR  RB      STATUS
    TIMER*TEST2  110523        90     572  79  01       IN DMR
    TIMER*TEST4  110553         6       1      02       IN DMR
    T/D  112354  062676
    TIMER*TEST1  112156         2                       IN DMR
  II TEST4 EX
  T◆
    ACTIVE RUNS:  VL/S25122  TIMER+  TEST4+  TEST2  TEST1+
  II TIMER RC
    TIMER*  ID     TIME       SEQ  UPDATE ERR  RB      STATUS
    TIMER*TEST2  110523        90     572  79  01       IN DMR
    TIMER*TEST4  110553         6       1      02       IN DMR
    TIMER*TEST1  112156         2                       IN DMR
  II TIMER OP
    PRI      INACTIVE
  II TEST4
```

```
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIMER*TEST2A 125124         3                   NOT IN DMR
II TIMER RC
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIMER*TEST2A 125124        11     34                 IN DMR
   TIMER*TEST4A 125131         9     11                 IN DMR
II TIMER RC
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIMER*TEST2A 125124        24    120                 IN DMR
II TIMER RC
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIMER*TEST2A 125124        32    171                 IN DMR
II TIMER RC
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIMER*TEST2A 125124        43    245                 IN DMR
II TIMER RC
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIMER*TEST2A 125124        68    419                 IN DMR
II TIMER RC
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIMER*TEST2A 125124        84    534                 IN DMR
II TIMER RC
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIMER*TEST2A 125124        95    612              QED  ON 10
   TIMER*TEST4A 125244         3                        IN DMR
SC PR ,
   PR1      INACTIVE
   PR:      TEST4  PR       108 PGS M PR2
II TIM R RC
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIMER*TEST2A 125124       114    745                 IN DMR
II TIM R RC
   TIME *  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIMER*TEST2A 125124       131    864                 IN DMR
   TEST A MAX - PAGES
II TIM R RC
   TIMER*  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   RSI (11/16 UD1601 - ACTV
   TIMER*TEST2A 125124       145    957                 IN DMR
II TIM R RC
   TIME *  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIME *TEST2A 125124       158   1051                 IN DMR
T*
   ACTI E RUNS:  TIMER+  TEST2A+  TEST4A+
   T/D  125406  062976
   TEST A FIN
II TIP R RC
   TIME *  ID     TIME       SEQ  UPDATE ERR  RB       STATUS
   TIME *TEST2A 125124       206   1390                 IN DMR
II TES 4A
   TEST A NOT ACTIVE
II TES 2A
   NO I  CNTGCY FOR  TEST2A
II TES 2A EX
   NO I: CNTGCY FOR  TEST2A
E TEST A
   WSG/ D1601 START
   TEST A*ABNORMAL TERMINATION * ATTEMPING INTERNAL ROLLBACK
   TEST A*RUN UNIT ROLLED BACK: IMPARTED BUT DID NOT DEPART
   TEST A FIN
    LOA  90552 7/6 0 -1 WSG
```

System Console Messages
And
Responses

IV-2-43

E

6. Console Messages And Responses

6.1. GENERAL

Each error message is one of eleven types depending on the functional area from which it originated. The error messages and responses in 6.2 are listed in alphabetical order.

System file initialization	Type 1
Quick-look file initialization	Type 2
TIMER	Type 3
DMR and LINKER	Type 4
Quick recovery	Type 5
Data base dumps	Type 6
Long recovery	Type 7
CHECKPOINT	Type 8
Selective recovery	Type 9
UPDATE	Type 10
DMRCLEAR	Type 11

6.2. ERROR MESSAGES AND RESPONSES

ABNORMAL TERMINATION

TIMER has terminated abnormally. Before exiting from the system, TIMER terminates the DMR. Type 3

ABNORMAL TERMINATION – ATTEMPTING INTERNAL ROLLBACK Type 4

The run unit has been abnormally terminated by an E console keyin, by a @@X or a @@TERM keyin from a demand terminal, by the Executive for max time, or by any user program terminating after the impart but before a depart. An attempt is made here to roll the run unit back.

ABNORMAL TERMINATION – CONTINUING RUN UNIT'S DEPART Type 4

An abnormal program termination occurred during a run unit's execution of a DEPART command. The APT termination handler will attempt to complete this command.

AREA MUST BE RELOADED AND

RUN-UNIT XXXXXX MUST BE REPROCESSED

Type 4, 5

An I/O error occurred during run unit rollback. The area specified on the previous I/O ERROR ON AREA message is not rolled back.

AREA REQUESTED FOR SELECTIVE RECOVERY IS NOT DOWN

Type 9

All areas requested for selective recovery must be downed through the DOWN utility command.

ALL SEGMENTS OF THE QLF ARE INITIALIZED

Type 2

Indicates the normal completion of quick-look file initialization.

ASG ERROR OF SYSTEM FILE

Type 6

System file has not been catalogued or this is an Executive dump routine problem. Load the previous data base dump and activate long recovery.

ASG ERROR OF AUDIT TRAIL

Type 6

Audit trail tape has not been catalogued. Restart the run stream which takes the data base dump.

AUDIT FREE REQUEST ALREADY IN PROGRESS

Type 3

This is the response to an II TIMER AF console keyin if a previous AF keyin has yet to be serviced to completion.

AUDIT SWAP REQUEST ALREADY IN PROGRESS

Type 3

This is the response to an II TIMER AS console keyin if a previous AS keyin has yet to be serviced to completion.

AUDIT TAPE NOT ASSIGNED

Type 3

This is the response to an II TIMER AF or II TIMER AS console keyin if the audit trail is not assigned.

BEFORE AN RP WAS FOUND

Type 7

This is the second part of a two part message. The first part describes the situation that has occurred (such as an I/O error). No recovery point has been passed. Use this point as a recovery point or error off long recovery.

BLOCK ERROR

Type 7

A block was found that long recovery does not recognize. A description of the condition under which this block was found follows. Go back to the previous recovery point, use this point as a recovery point, or error off long recovery

CANNOT ACTIVATE DMR ERROR STATUS ________ Type 7

This error message comes from the routine DMRACT and indicates:

07	Quick recovery is in progress.
08	Run-id is wrong.
09	Abort switch is set.
10	TIMER not on (DMR configured without TIMER).

CANNOT ASG SYS FILE. CONTINUE? Y OR N Type 10

The update routine assigns the systems file exclusively. If the TIMER is active and has assigned the systems file, UPDATE cannot access the systems file. The operator should type in Y if TIMER exits. An N reply will error off UPDATE.

CANNOT ASSIGN AUDIT TAPE Type 3

An error was returned by the Executive when TIMER tried to assign the audit trail tape file. A0 in snap named IV02XX contains the bits indicating the error set by CSF$.

CANNOT ASSIGN AUDIT TRAIL Type 7

Executive or long recovery routine problem. Delete catalogued audit trail tape and restart long recovery.

CANNOT ASSIGN SYSTEM FILE Type 7

The data base dump which was just reloaded may be wrong. Load the previous data base dump and retry long recovery.

CANNOT CATALOGUE AUDIT TRAIL Type 7

Executive or long recovery routine problem. Delete catalogued audit trail tape and restart long recovery.

CANNOT FIND SPECIFIED UNIT. CHECK FORMAT Type 10

The tape unit number was not found in the systems file. Check format of reply and type in unit number again.

CANNOT READ LAST BLOCK. START LONG RECOVERY. Type 3

An error was encountered writing a tape block. A write of an end-of-reel block marker was attempted, but an error occurred. The TIMER then tried to read back the last block, but could not. Start long recovery up to the last recovery point written.

CANNOT REPOSITION TAPE. START LONG RECOVERY. Type 3

An EOF could not be found on the current audit trail tape. Do long recovery up to the last recovery point.

CHECKPOINT Type 7
MM:DD:YY HH:MM:SS SEQXXXXXX AX

While building the active user list (the determination stage), long recovery prints out the checkpoint asked for.

CHECKPOINT AT MM:DD:YY HH:MM:SS NO.XXXXXXX Type 8

When the checkpoint has been taken, this checkpoint information is typed out. The SS number is the sequence number used to identify the checkpoint for recovery on the SEQ card or keyin.

CHECKPOINT ERROR CODE X Type 8

If the following errors occur during CHECKPOINT execution, this message with its code is typed out.

code: 6 I/O error writing a checkpoint.
7 Request made for CHECKPOINT while a CHECKPOINT is already in progress.
8 Illegal RUN-ID.

CONTINGENCY IN USER PROGRAM – ATTEMPTING ROLLBACK Type 4

A contingency occurred in the user code while a run unit was active i.e., between an IMPART and a DEPART command. The run unit will be rolled back if possible. This situation occurs only when the DMR is collected with the run unit.

CONTINGENCY–QUICK RCVY NOT POSSIBLE Type 5

I/O contingency has occurred. Start long recovery.

CONTINUE Y OR N? Type 7

A point is reached when a decision must be made (an error has been made or a recovery point has been reached). If a Y response is given, and the active run unit list is being built, the determination stage will continue to the next recovery point. If this was a recovery using before looks, the recovery point to recover to will be requested. If an N response is given, and this was the determination stage, recovery will take place to this block. If recovery was in progress using before looks, recovery is done except for rolling back active run units.

DEPART UNSUCCESSFUL – ERROR STATUS XXXXXX Type 4

An abnormal program termination occurred during a run unit's execution of a DEPART command. The APT termination handler attempted to complete this command. The command failed for the reason indicated.

DMR ERROR, RELOAD SCHEMA *schema-name* Type 4

DMR – GS0 run unit received I/O error in reading schema. Run unit must be rolled back and schema reloaded.

DMR IN POSSIBLE LOOP. – CONTINUE? Y OR N Type 4

While processing an abnormal termination the DMR may have entered a loop. A response of Y allows the DMR to continue for another fixed time period. A response of N causes a DMR termination.

DMS AUTO-RECOVERY PERFORMED Type 3

After a system failure or DMR termination the first run unit or quick recovery entering the DMR will cause the TIMER to automatically clear the DMR system buffer and print the above message. Run units can begin processing again.

DMS RUN UNIT INTERRUPTED AE Type 4

LINKER – The operator II keyin was received by the run unit. If the message is answered with an E, the message II RECEIVED is displayed on the system and run unit is rolled back. If the message is answered with A, the run unit will continue. If this message does not appear after an II keyin, the run unit does not have a contingency routine registered and quick recovery must be performed to remove the run unit's registration with the DMR (applies only when the system generation parameter CDBAPT=0).

DMS RUN UNIT MAX CARDS AE Type 4

This run unit has exceeded its punch file limit. Answer A to ignore this condition; answer E to initiate a depart with rollback.

DMS RUN UNIT MAX PAGES AE Type 4

This run unit has exceeded its print file limit. Answer A to ignore this condition; answer E to initiate a depart with rollback.

DUMP FOUND BEFORE RP ASKED FOR Type 7

During the building of the active run unit list, a dump indicator was found. The recovery point (or checkpoint) that was specified was not passed. Use this block to recover to, go on to the next block, or terminate long recovery in error.

DURING RECOVERY STAGE, USING NO BEFORE LOOKS Type 7

This is the second part of a two part message. The first part described what has occurred (i.e., I/O error). Since the active run unit list has already been built and there are no before looks on the tape, the error is unrecoverable. Therefore, long recovery terminates in error and must be rerun to a previous recovery point.

DYNAMIC DUMP ERROR CODE xx Type 6

The error code will be one of the following:

01	Unable to perform DYNDUMP request (A or S)
02	Bad option
03	DYNDUMP in progress
06	Unable to accomplish CKPT
10	TIMER not on
11	No audit trail tape

DYNAMIC DUMP ERROR – INVALID OPTIONS Type 6

The only legal options are A, C, N, and S.

EOF FOUND BEFORE A RP: ALLOWED, Y OR N?
Type 7

The EOF was found on the tape but no recovery point was passed. If a Y response is given, recovery takes place to the end of file. If an N response is given, long recovery errors off and should be rerun using a previous tape and possibly to a previous recovery point.

EOF REACHED
Type 7

The determination stage prints this message when it has found the EOF. Recovery prints it when the EOF has been recovered to.

EOR FORMAT BAD
Type 9

The end-of-reel format is bad. Long recovery must be used to recover to an earlier recovery point.

ERROR OFF DMS RUNS
Type 4

This message occurs if TIMER is terminated unexpectedly via an E TIMER or II TIMER II keyin. Active DMS run units should be terminated by an E keyin.

ERR *octal-status* OCCURRED DURING REEL SWAP
Type 9

An error occurred while going from one audit tape to the next. This is probably a tape or Executive error. Long recovery must be used to recover to an earlier recovery point. For an explanation of octal status see Appendix C of Volume 2 EXEC Programmer Reference, UP–4144.2 (current version).

ERROR ASSIGNING SYS FILE. TIMER POSSIBLY ACTIVE
Type 3

An error was returned by the Executive when TIMER tried to assign the systems file. See A0 in the L$SNAP done by TIMER for CSF$ bit indications. Long recovery will probably have to be started. A termination condition is set by TIMER.

ERROR DETECTED IN CATALOGUING *audit trail tape*
Type 1

Restart the run which initializes the system file.

ERROR DOING I/O SYSTEM FILE
Type 10

A read or write error was received while doing I/O to the systems file.

ERROR DURING CHECKPOINT
Type 9

Restart selective recovery. This is probably a tape error. Data base dumps need not be reloaded.

ERROR IN QUICK RECOVERY
    START LONG RECOVERY
Type 5

Quick recovery cannot be performed. Long recovery should be initiated.

ERROR IN STARTING QUICK RECOVERY — Type 3
START QUICK RECOVERY FROM CONSOLE

The TIMER received an error in starting the run stream in the element DMS*DMRMT.QUIREC for performing quick recovery. The user-specified run stream for quick recovery must be started from the system console. Note that this run stream should be placed in the element DMS*DMRMT.QUIREC.

ERROR OCCURRED DURING FREE OF AUDIT TRAIL TAPE — Type 9

Long recovery must be used to recover to an earlier recovery point.

ERROR ON ART FIND — Type 9

An error was received in accessing an area reference table with a bad area code. The audit tape is probably bad and long recovery must be used to recover to an earlier recovery point.

ERROR RETURN FROM DMR STATUS ________ — Type 6

If error status is:

07	Quick recovery is in progress.
08	Run-id is wrong.
09	Abort switch is set.
10	TIMER not on (DMR configured without TIMER).

ERROR. RUN run-unit-id MUST RE-DO PA INITIAL LOAD — Type 7

The run unit named encountered an error doing a pointer array initial load. This must be redone when long recovery has finished.

EX KEY-IN NOT ALLOWED – IGNORED — Type 3

An II TIMER EX keyin occurred at a time when run units were active. The keyin has no affect.

FILE *file-name* HAS NOT BEEN ASSIGNED — Type 7
CONTINUE? Y OR N

- If the operator types in N, the long recovery routine terminates itself. Therefore, the operator should reactivate long recovery after adding the required @ASG statements to the run stream which initiated long recovery.

- If the operator types in Y, that file will not be recovered.

FILE XXXXXXXXXXXX CANNOT BE ASSIGNED — Type 5

Quick recovery fails in its attempt to assign the named quick-look file. Very likely the quick-look file is not presently catalogued.

file-name WILL NOT HOLD ALLOTTED SEGMENTS — Type 2

The named quick-look file is not large enough to contain the segments defined in DMSSGP.

FITEMS CANNOT GET REEL NUMBER Type 7

The operator did not respond with the reel number of the new audit trail tape within the DMR-specified amount of time.

FITEM$ ERROR Type 7

Executive or long recovery routine problem. Restart long recovery.

FOLLOWING RUN-UNITS WERE ACTIVE AT CHECKPOINT Type 7

run-unit-id
⋮

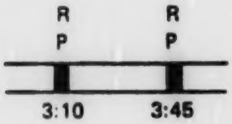
When the checkpoint was reached, a different number of run-unit-id's were present in the ID list than were indicated in the checkpoint block. This is either a bad checkpoint, SRU (start of run unit), or ERU (end of run unit) block. Long recovery will error off and should be rerun to a previous checkpoint (or recovery point).

FOLLOWING RUN-UNITS WERE ACTIVE AT THE RP. Type 7

After completion of long recovery, the run units which were active at the recovery point will be typed out.

No run units will be active at a checkpoint.

FOUND RECOVERY POINT LATER THAN SPECIFIED
NECESSARY TO GO BACK TO PREVIOUS ONE, Y OR N? Type 7



- If the operator had specified 3:30, long recovery routine recovers up to 3:45 and types out the above message.
- If the operator types in Y, long recovery goes back to 3:10.
- If N, 3:45 is considered as the recovery point requested.
- If neither N or Y, the same message will be typed out again.
- If checkpoints are being employed, and no before looks exist, an answer of N should be given.

GO BACK TO PREVIOUS RP, Y OR N? Type 7

A message or messages previously printed describe the circumstances of the error (e.g., block error). If a Y response is given, and the active run unit list was being built, it will be built backwards to the previous recovery point. If recovery using before looks was taking place, the run units are rolled back to the previous recovery point. If an N response is given, long recovery errors off and should be rerun to a previous recovery point.

HOW MANY UNITS? 1 OR 2 Type 7

If ATTUS2 EQU 1 in DMSSGP, this message is typed out. The operator should type in the number of units to be used for the audit trail tape for recovery.

IF SYSTEM WENT DOWN WHILE DMR WAS ACTIVE Type 3

PUT EOF ON XXXXXX AND REWIND. ANSWER C WHEN DONE

If the system went down while there were run units active, an EOF is requested to be written manually by the operator on the current DMR audit trail tape (XXXXXX) (see 4.2).

ILLEGAL BLK DURING BACK TO RP Type 7

Load the same data base dump and reactivate long recovery changing the recovery point.

ILLEGAL BLOCK Type 9

An illegal block was found on the audit trail tape. Long recovery must be used to recover to an earlier recovery point.

ILLEGAL BLOCK, GO BACK TO EARLIER RP Type 7
WHICH RECOVERY POINT? MMDDYYHHMMSS or SEQXXXXXXAX

The operator should type in the time or the sequence number.

If checkpoints are being employed and no before looks exist on the audit trail, long recovery should be aborted, the data base dump reloaded, and recovery reinitiated to an earlier checkpoint.

INTERNAL ERROR STATUS *mm* Type 7

DMR or long recovery routine problem. Load the same data base dump and reactivate long recovery changing to an earlier recovery point or checkpoint.

01 Block which has a DMR BLOCK indicator has been read which has an illegal block type.
02 A block has been read which contains all zeroes.
03 An SOR block which has the wrong number of words of previous reel has been read.
04 More areas are used than were specified in the MNAREA parameter of DMSSGP.

INVALID EQUIPMENT TYPE FOR MTU Type 1

An input was received which does not describe a tape unit configured in user's site.

I/O ERROR Type 7

An I/O error has occurred. The messages following this message will describe the circumstances.

I/O ERROR DURING BACK TO RP Type 7

Load the same data base dump and reactivate long recovery changing the recovery point.

I/O ERROR, GO BACK TO EARLIER RP
WHICH RECOVERY POINT? MMDDYYHHMMSS or SEQXXXXXXAX

Type 7

The operator should type in the time or the sequence number.

If checkpoints are being employed and no before looks exist on the audit trail, long recovery should be terminated, the data base dump reloaded, and recovery reinitiated to an earlier checkpoint

I/O ERROR *octal-status* OCCURRED ASSIGNING AUDIT TRAIL

Type 9

Reload data base dumps and restart selective recovery. For explanation of octal status, see Volume 2 EXEC Programmer Reference, UP–4144.2 (current version).

I/O ERROR *octal-status* OCCURRED READING AUDIT TRAIL

Type 9

Use long recovery and recover to an earlier recovery point. For explanation of octal status, see Volume 2 EXEC Programmer Reference, UP–4144.2 (current version).

I/O ERROR *octal-status* OCCURRED WRITING TO DATA BASE AREA *area-name*

Type 9

Reload data base dumps and restart selective recovery. For explanation of octal status, see Volume 2 EXEC Programmer Reference, UP–4144.2 (current version).

I/O ERROR OF AUDIT TRAIL

Type 6

Load the previous data base dump, and activate long recovery.

I/O ERROR OF SYSTEM FILE

Type 6, 7

Load the previous data base dump and initiate long recovery, or reload the same data base dump and reactivate long recovery.

I/O ERROR ON AREA XXXXXXXXXXXX

Type 4, 5

IT IS DOWN, USE SELECTIVE RECOVERY TO RECOVER IT

This two part message occurs during quick recovery or run unit rollback. It indicates that a quick-before look could not be applied to the area specified and that area has been downed. It should be recovered by selective recovery.

I/O ERROR ON NEW AUDIT TAPE, IT IS UNUSABLE

Type 7

If long recovery finds an I/O error in the new audit trail tape while writing recovered after looks to it, long recovery will go back to the recovery point and retry. The tapes which were used in the first try are of no value. A new reel should be loaded for the retry.

I/O ERROR
TRYING TO WRITE AN EOR
WRITE EOR 1 BLOCK BACK, Y OR N?

Type 7

An I/O error was encountered while trying to write the end of reel block on the old audit trail tape. If a Y response is given, the preceding block will be read, the active run unit list will be updated if necessary, and the EOR will be written over this block. Recovery will then take place to the EOR. If an N response is given, long recovery will error off and should be rerun to a previous recovery point.

LOAD SS/UU AUDIT-TRAIL 1 –1: TYPE C WHEN DONE

Type 3

This message occurs when the DMR is utilizing two audit-trail-tape tape units. The operator is directed to mount the tape on the specified subsystem and unit.

MTU TYPE FOR AUDIT TRAIL TAPES (XXX)

Type 1

The operator is to keyin the equipment type used at his facility. A 3-character type-in is required with leading zero if necessary.

MTU TYPE XXX REQUIRED.

Type 6, 7

Tape unit type XXX is not available. Unit must be upped.

NEW AUDIT TRAIL FULL, TYPE IN NEXT REEL NO.

Type 7

If the new reel which contains the recovered after looks becomes full, the long recovery routine requests another reel. The operator must type in the 6-character number for the next reel.

NEW SUBS AND UNITS ARE *subsystem-number/unit-number/unit-number*

Type 10

This message will give the new subsystem number and tape unit numbers upon completion of UPDATE routine.

NO MORE ROOM IN DOWN LIST, DOWN ALL DONE

Type 4, 5

Quick recovery or run unit rollback had to declare an area down because an I/O error occurred. The downed area list was already full. Consequently, all areas have been declared down and must be recovered by long or selective recovery.

NO RECOVERY POINT TO GO BACK

Type 7

This is the second part of a two part message. The first part describes the error condition. There is no recovery point to go back to. If no message is printed requiring a decision (e.g., STOP, Y OR N?), long recovery will error off and should be rerun to a previous recovery point.

NO RECOVERY POINT TO GO BACK
DATABASE WILL BE RECOVERED

Type 7

An error has occurred in reading the audit trail tape prior to passing a recovery point. The data base will be reinstated to its condition after the data base dump was loaded. Reprocess the run units which were processed after the data base dump was taken, or load the previous data base dump and reinitiate long recovery. If no before looks were present on the audit trail tape, the data base must be reloaded.

NO REEL TO GO BACK TO
Type 7

While attempting to swap a tape backwards (e.g., going back to a previous recovery point), long recovery finds no previous reel number in the start-of-reel block of the current tape. (This is the first tape after a dump.) Long recovery will error off and should be rerun using a different tape or to a previous recovery point.

NO RUNS ACTIVE IN DMR
Type 3

An II TIMER RC keyin occurred when no run units were active in the DMR.

NO TASK RUN UNIT TABLES FOUND
Type 3

An RC keyin occurred but no task run unit tables could be found. This indicates an internal DMR error. When possible, DMRCLEAR should be run.

PLEASE TERMINATE THIS JOB VIA X KEYIN
Type 4

Job is terminated with an X console keyin. This message follows an N response to the message: DMR IN POSSIBLE LOOP.

quick-look-file-name HAS NOT BEEN ASSIGNED
Type 2

The run stream which initiates quick-look file initialization must assign the quick-look files.

quick-look-file-name NOT INITIALIZED – I/O ERROR
Type 2

Restart the run stream which initializes the quick-look files.

QUICK RCVY ALREADY IN PROGRESS . . . END THIS RUN
Type 5

Error off the run stream started to initiate quick recovery.

QUICK RECOVERY FINISHED
Type 5

Normal completion of quick recovery.

READING AUDIT TRAIL IN DETERMINATION STAGE
Type 7

This is the second part of a two part message. The first part describes the error that has occurred while the active run unit list was being built (determination stage). This error occurred while reading the audit trail tape.

RECOVERED TO MM:DD:YY HH:MM:SS SEQ. *number* DUMP *number*
Type 9

Before selective recovery exits, it prints out the above recovery point which was reached.

RECOVERED UP TO RECOVERY POINT
Type 7
or
RECOVERED UP TO CHECKPOINT

MM:DD:YY HH:MM:SS SEQ XXXXXXAX

Before long recovery exits, it types out the final recovery point or checkpoint which is used.

RECOVERED UP TO RECOVERY POINT
or
RECOVERED UP TO CHECKPOINT

Type 7

MM:DD:YY HH:MM:SS SEQXXXXXXAX

CONTINUE Y OR N?

When long recovery routine finds the recovery point or checkpoint specified by the operator, it types it out as above.

- If the operator types in N, that recovery point or checkpoint is considered as the one specified.
- If the operator typed in Y, long recovery asks for a new recovery point or checkpoint and continues to recover.

RECOVERY POINT
MM:DD:YY HH:MM:SS SEQXXXXXX AX

Type 7

While building the active user list (determination stage) long recovery prints out the recovery point.

REEL # FOR NEW AUDIT TRAIL TAPE (OOXXXX)

Type 7

The operator should type in the 6-character number of the reel to be used for the audit trail tape.

REEL # FOR FIRST AUDIT TRAIL TAPE (OXXXXX)

Type 1

The operator is to type in the first reel number to be used for the audit trail. A 6-character keyin is required with leading zeros if necessary.

REEL # FOR NEXT AUDIT TRAIL TAPE (OXXXXX)

Type 1

Same as above for second reel number.

RELEASE DMR AUDITSERVO(S) SS/UU

Type 3

This message follows directly after an II TIMER AF console keyin and it directs the operator to release the tape units which had previously been reserved for the TIMER.

RERUN LONG RECOVERY TO A PREVIOUS RP

Type 7

This is the second part of a two part message. This first part describes what error has occurred. Long recovery will error off and should be rerun to a previous recovery point.

RSWAPS ERROR

Type 6

EXEC or dump routine problem. Load the previous data base dump and activate long recovery

RSWAPS REQUEST ERROR

Type 7

Long recovery routine or Executive problem. Load the same data base and reactivate long recovery changing the recovery point or checkpoint.

RSWAP$ REQUEST ERROR

Type 7

Long recovery routine or Executive problem. Load the same data base and reactivate long recovery changing the recovery point or checkpoint.

RU-ID *6-char-id,* CONTINGENCY ERROR TYPE *octal-code*

Type 4

DMR – GS04 run unit received a contingency within the DMR.

1. 6-char-id – first six characters of RU-ID specified in the DMCA.
2. octal code – two digit octal contingency code (see LINKER T.D. or Volume 2 EXEC Programmer Reference, UP–4144.2 (current version)).

RU-ID *6-char-id,* I/O *read-write* ERROR *octal-code,* FILE *area-name*

Type 4

DMR – GS04 run unit received an I/O error (contingency or inline return).

1. 6-char-id – first six characters of RU-ID specified in the DMCA.
2. read-write – whether operation was a read or write.
3. octal-code – two digit octal I/O error code.
4. area-name – 12 character area name from which I/O error was received.

RUN UNIT CONTROL TABLE CLEARED. RE-START DMR

Type 11

This message indicates successful completion of the program DMRCLEAR.

RUN UNIT DEPART SUCCESSFUL

Type 4

An abnormal program termination occurred during a depart. The depart was successful. The run unit is terminated at the completion of the depart. No rollback is initiated by termination handler.

NOTE:

If the run unit command was DEPART WITH ROLLBACK, then rollback has been performed.

RUN UNIT IMPARTED BEFORE QUICK RCVY
QUICK RCVY NOT POSSIBLE

Type 5

Quick recovery should not have been started. Error of the run stream which initiated quick recovery

RUN UNIT ROLLBACK TO BE DONE INSTEAD OF COMMAND

Type 4

An error occurred while performing command rollback and the run unit must be rolled back.

RUN UNIT ROLLBACK UNSUCCESSFUL – ERROR STATUS XXXXXX

Type 4

Attempted rollback failed for reason indicated in error status. Run unit remains registered with the DMR. Initiate quick recovery.

RUN UNIT ROLLED BACK; IMPARTED BUT DID NOT DEPART

Type 4

An attempted run unit rollback, initiated because of abnormal termination, was successful.

RUN UNIT XXXXXX TIMED OUT. CONTINUE? Y OR N.

Type 3

A run unit is in a possible loop. If either of the following is true, type in Y:

1. The time-out is to be ignored.
2. The operator will try to terminate the run without affecting other run units.

Type in N if a DMR abort is required. If a run unit is in a loop, and does not come into the DMR, terminate the run, and after it has errored off, type in II TIMER II to cause the DMR to be released from main storage.

RUN-ID *6-char-id* HAS BEEN RECOVERED

Type 5

This message will be given at the completion of the removal of each run unit.

RV ONE XXX SERVO(S): RESPOND WITH SS/UU
or
RV TWO XXX SERVO(S): RESPOND WITH SS/UU/UU

Type 3

The audit trail tapes are about to be assigned. The operator must first reserve the requested number of tape units, and then respond with the subsystem and unit numbers of the reserved tape units. The tape unit type cannot be changed by the operator.

RV SERVO(S) SXXX/UXX/UXX. TYPE C WHEN DONE

Type 3

The operator must reserve the units in the subsystem specified in the above message. When it is done, type in "C".

SEGMENT NUMBERS ARE NOT SEQUENTIAL

Type 2

The numbers, or IDs, given to the segments in DMSSGP are not sequential.

SEGMENT OVERLAYS PRIOR SEGMENT.

Type 2

Indicates that a relative start address in the user-defined table QLSADD preceded the end of the prior write segment.

SOR BLOCK CANNOT BE WRITTEN ON TAPE XXXXXX.

Type 3

A start of reel block could not be written on a new reel. No operator action required, unless the next message is typed out.

SOR FORMAT BAD

Type 9

The start of reel format is bad. Check tape number and if incorrect, reload data base dump and restart selective recovery. If correct, long recovery must be used to recover to an earlier recovery point.

SOR MARK ERROR

Type 7

Load the same data base dump and reactivate long recovery changing the recovery point or checkpoint.

START QUICK RECOVERY

Type 4

DMR – GS07 a run unit has aborted and quick recovery must be started after all run units have terminated.

STOP, Y OR N?

Type 7

This is the second part of a two part message. The first part describes the situation. If a Y response is given, the last block read will be the one recovered to. If an N response is given, long recovery will error off and should be rerun to a previous recovery point.

SYS FILE ERROR. START LONG RECOVERY.

Type 3

An error occurred while reading or writing from the systems file.

system file name HAS BEEN INITIALIZED

Type 1

Indicates the normal completion of system file initialization.

system file name NOT INITIALIZED – I/O ERROR

Type 1

Restart the run which initializes the system file.

TERMINATE TIMER WITH II KEYIN

Type 4, 5

Type 4 – Two contingencies occurred within the same program. Must terminate DMR and start quick recovery (applies only if CDBAPT=0).

Type 5 – A problem occurred in attempting to dynamically assign a file during quick recovery. Quick recovery cannot proceed.

Type 5

THE FOLLOWING AREAS ARE UNRECOVERABLE, NO B/L

Type 7

When long recovery applies before looks to the data base, if some areas do not have before looks, the list of these areas names will be printed out. Therefore, these areas have not been recovered completely.

THE FOLLOWING RUN-UNITS WERE ACTIVE

Type 7

After completion of long recovery, the run units which were active at the recovery point or EOF will be typed out.

THE FOLLOWING RU-IDs LEFT AFTER CHECKPOINT run-unit-id ⋮ This is probably an error in the selective recovery routine.	Type 9
TOO FEW SEGMENTS HAVE BEEN DEFINED There must be at least as many segments defined as there are number of run units allowed.	Type 2
TYPE IN BAD UNIT NO. 3 DIGITS, (UX) OR (UXX) The operator will type in the number of the bad tape unit.	Type 10
TYPE IN NEW UNIT NO. IN SAME FORMAT AS ABOVE The operator will type in the number of the new tape unit replacing the bad unit in the same format as the first message.	Type 10
TYPE IN NEXT REEL NO. XXXXXX The operator should type in next number of audit trail tape. He must type in six characters without blanks.	Type 6
TYPE IN NEXT REEL'S 6 (SIX) CHARS NO. The operator must type in the new reel's tape number. Six characters must be typed in (leading zeros).	Type 3
TYPE 6 CHARACTERS PLEASE This message appears if one of the characters typed in to answer the preceding message is a blank. Input the 6-character reel number again.	Type 7
UNITS SS/XX/XX NOT AVAILABLE The tape units indicated, which were declared reserved by the operator, are not actually available. This indicates that the operator did not reserve the units he specified.	Type 3
UP UNIT. ANSWER Y. The tape unit was down. Type in Y when it is upped.	Type 3

WHICH RECOVERY POINT? MMDDYYHHMMSS OR SEQXXXXXXAX

Type 7

The operator should type in the time or the sequence number.

If checkpoints are being employed and no before looks exist on the audit trail, long recovery should be terminated, the data base dump reloaded, and recovery reinitiated to an earlier checkpoint.

MM = Month
DD = Day
YY = Year
HH = Hour
MM = Minutes
SS = Second

blanks must not be typed in

If the sequence number if 32 and long recovery routine should continue to recover past 1 data base dump,

SEQ32ΔΔΔΔA1

or

SEQ032ΔΔΔA1
SEQ0032ΔΔA1
SEQ00032ΔA1
SEQ000032A1

AX is not optional. The operator must type in even in the case of A0.

These responses indicate recovery to a recovery point, or possibly a checkpoint, using before looks.

In response to a message to go back to an earlier recovery point or to continue to recover, only the above responses should be used.

When the message (WHICH RECOVERY POINT?) is printed alone because of bad input or no input card, the above two responses or any of the following may be used:

MMDDYYHHMMSS ON TAPE xxxxxx
or
SEQXXXXXXAX ON TAPE xxxxxx

"ON TAPE" must be present. The xxxxxx after the ON TAPE phrase is the 6-character alphanumeric tape number.

CMMDDYYHHMMSS
or
CSEQXXXXXXAX

The "C" indicates recovery to a checkpoint using no before looks.

EOF ON TAPE xxxxxx

The "ON TAPE" must be present. The "EOF" indicates this is a recovery to the end of the file using no before looks.

XX RUNS QUEUED ON IMPART Type 3

An II TIMER RC keyin found run units queued because the maximum number of run units were already active.

@USE ERROR OF AUDIT TRAIL Type 7

Executive or long recovery routine problem. Delete catalogued audit trail tape and restart long recovery.

IV.3. PROCEDURES FOR DATA BASE LOAD

The following paper is a good summarization of experiences, including suggestions and recommendations, for loading a data base.

The actual loading of a data base must be preceeded by the collection and verification that the data is reliable. In contemplating the use of a DBMS, many users have experienced the problem of dealing with similar data being spread over many files, and the difficulty of determining which is data is the most up to date.

Prior to looking at loading techniques, let's consider certain aspects of data accuracy.

Data Accuracy

Data processing personnel have always been plagued with the problem of reliable data, but the data base administrator is under extreme pressure, since data is viewed as a corporate resource. All users demand a very high level of integrity in the data base, but insuring data accuracy becomes increasingly difficult as more users have access to the data.

One technique for maintaining control over data is the use of a Data Dictionary/Directory, or the DD/D. By creating one, you can achieve the following:

1. A specific department is designated as the collection agency for an element and, as such, is responsible for the original input. This pinpoints responsibility and usually results in more accurate data and better editing.

2. The definition of data is recorded, explaining whatever is necessary for unambiguous usage of an element. For example, in a university setting, the term "annual pay rate" could have more than one meaning when some faculty members are on a 9-month appointment, and others are on a full calendar year salary base.

3. The department responsible for updating an element is noted, along with the frequency of update. This encourages a department to maintain its area of a data base.

4. The production programs accessing this element are listed. Although this information is difficult to acquire and maintain, the benefits become obvious as soon as you consider changing something about that element.

5. A cross reference to other related elements is provided. Using the previous example, if the definition of annual rate of pay was not what you needed, the cross reference might list adjusted annual rate of pay.

Regardless of whether or not your DD/D is computerized, it should be published in a readable format, and every department or user should be advised of its possibilities. This will encourage better usage of the data base, since some potential misunderstandings will have been eliminated.

The dictionary will probably be an integral portion of the data base design phase and not a separate activity. As you plan for the inclusion of an element in the data base, the need for all the above information become abvious. However, the format (or coding, or whatever) of that element should meet all the requirements for general usage if more than one user will be accessing that element. Even though you may be designing a small portion of the data base, the other departments that will be using the same information in the future have just as strong an interest in the data definition, update schedule, etc. Therefore, it is important to involve your users as much as you can in this activity.

The following is a paper which represents a combination of thoughts and experiences concerning the area of Data Base Loading Techniques.

DMS 1100 INITIAL LOAD TECHNIQUES

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The objective of this paper is to present various techniques that can be used to improve the performance of your database initial load using DMS 1100. A considerable amount of feedback and information from DMS 1100 users, both from the field, for example, the paper written by Bruce Caskey of Sandia Laboratories, and from within UNIVAC, where DMS is being used by several departments, contributed to this paper.

Initial load techniques are grouped under two main headings: first, those techniques that affect only the initial load process and, second, those that, in addition affect subsequent processing, whether favorably or adversely. Each can be broken down even further into several areas of discussion.

Affect Only Initial Load

1. Off line procedures are those processes that are performed outside of DMS 1100 prior to the execution of the initial load.
2. A unique initial load schema is one especially designed to improve initial load, and which will be discarded in favor of a processing schema after initial load has taken place.

3. Recovery considerations for the initial load must be taken into account. These are dependent on the volume of data to be loaded.

4. The type of DMR configuration being used and its mode of operation must also be considered.

Off Line Procedures

Let us now look at each of these factors in detail. The first consideration is that of mass storage device allocation. Attempt to use the fastest available devices for initial load even if, when normal processing takes place, the areas are to be placed on slower devices. Also, attempt to distribute the areas across devices to minimize head movements. In general, the latter is a good rule to follow during normal processing as well as initial load.

There are a number of load strategies to follow. These include the use of a level by level approach in loading a hierarchy or network, that is, load all the owner records first, followed by their members. This avoids the possibility that previously stored members might prevent the proper positioning of subsequently stored owner records.

Second, before the load, presort member records having sort keys using the standard sort package. This avoids the necessity of having the DMR perform an item extraction and comparison when storing each member record. Third, if records are being stored with a Location Mode of CALC, execute the calc routine off line and presort these records on the output page number of the calc routine. This avoids excessive head movement as well as premature initialization of pages. This is particularly advantageous when a randomizing type of calc routine, such as DMSCALC, is used. Fourth, having presorted the calc records, definitely store them first. This will minimize instances of calc records going to overflow. Finally, whenever possible eliminate duplicates (if necessary to do so) when sorting or through a pre-screen program, again avoiding the necessity of having the DMR perform item extractions and comparisons when storing each record.

The last off line consideration is to make certain that user calc routines, when mapped with the initial load programs, are not placed in overlayable segments. The same holds true for DMSCALC when using a segmented DMR.

Initial Load Schema

When creating a unique initial load schema, distinct from the schema used for processing, the location mode clause for calc should state that duplicates are allowed. This relieves the DMR from the task of searching all records on a calc chain to prevent storage of a duplicate each time a new calc record is stored. As pointed out above, if duplicates are not allowed, they may be eliminated by means of a pre-screen program.

Along the same vein, sets whose set order is sorted, whenever possible, should be changed to an order of next. This avoids the necessity to perform item extractions and comparisons on each store of a new member.

If the use of sorted sets cannot be avoided during initial load, then specify that duplicates are allowed, and that set occurrence selection is current of set. Again, as mentioned above, pre-sorting and pre-screening techniques may be used to avoid DMR item extraction and comparison, for either sorting or checking for duplicates, on a record by record basis during initial load.

The most efficient technique for storing members into sets during initial load is to redefine the set with an order is next and a set occurrence selection is current of set. With this set definition the DMR is able to add each new member record to the set with a minimum of overhead, because the system retains the data base key of the previously stored record and needs make no item extraction and comparison or any access to other records to determine the logical insert point.

Another clause which can be very effectively used in the initial load schema, but omitted from the processing schema is the page range specification option on the within clause. This clause, which provides for a run unit adjustable lower and upper page search bound, can speed the storing of records located via set. The system picks the lower page bound as the starting page in its search for space. This starting page is known or computed by the initial load run unit based upon its knowledge of the structure of the data.

One note of caution when using a load schema. It is a common mistake to assume a set order of last is the proper load technique to use. However, when the set order is last the system automatically adds a prior point to the owner record. This will cause errors if the processing schema does not also specify order is last. The only other way to avoid this problem and still use order is last is to also specify prior pointers.

The specification of pre-initialized pages is not recommended. Pre-initialization requires one I/O for each page initialized. Whereas, if the initial load of the area is sequential (and it will be if the off line procedures discussed above are followed), the DMR will initialize each page as it is first used without any additional I/O. The recovery procedures and requirements of non-initialized pages will be discussed later.

Finally the clause specifying the writing of before and after looks to the audit trail tape should be omitted from the initial load schema. If a back up of the area once loaded is required, a dump can be taken via @COPY,G in place of the after looks.

The third factor which affects only the performance of the initial load is that of recovery considerations.

Recovery Considerations

The recovery requirements of the initial load process is dependent upon the volume of data to be loaded, and the time constraints involved.

The first rule is to avoid the use of command quick before looks. The overhead associated with command quick before looks during initial load is sufficient to preclude their use. This is because the intent of much of what has been discussed up to this point is to allow a number of records to be stored on the same page by successive commands. If an error occurs during initial load it should automatically imply run unit rollback.

A better approach is to use the FREE command to break up the initial load process. When using the FREE command in conjunction with pages that have not been preinitialized, the System File is required. The System File contains a list of the areas open for initial load and the last page initialized in each area. It is updated on each FREE command and is used when, on a restart, the area is reopened for initial load.

A special note should be made at this point, regarding index sequential and pointer array storage structures. An initial load of index sequential records causes the index to be created. The index remains forzen during normal processing, however, a technique is available to add additional entries to the end of the index. If the expandable clause is used on the allocate clause of the index area, the index area can be expanded and then reopened for initial load. It is mandatory that the schema be changed to specify pre-initialized pages and that the page initialization routine be executed prior to the continuation of the load. Pointer array initial load is also unique in that the arrays are not built until the pointer areas are closed. Two temporary files are used to accumulate the pointers during the load, and the arrays themselves are sorted and built on the execution of the CLOSE command. The FREE command handles these pointer arrays initial load temporary files independently of the areas.

As implied above, run unit quick before looks should be used for rollback and quick recovery purposes. When FREE's are executed and non-initialized pages are used, quick looks are taken only if the page being altered was initialized prior to the last FREE command. For example, if page initialization at the time of the last FREE was up to page 10 and the page initialization is now up to page 14; if page 12 is now altered a quick look is not taken, whereas if any page prior to page 10 is altered, a quick look is taken. If pre-initialized pages are used, an overhead is introduced, as quick looks are taken of all altered pages regardless of their position relative to the last FREE command causing multiple quick looks to be taken of the same page.

A final suggestion under recovery requirements, is that the user data required for restart can be saved using the DMR by establishing separate area and record types in the unique load schema. This is particularly useful when the initial load process is broken up using the FREE command. Recovery of this information is automatically performed by DMS thereby making the restart process simplier.

Tailored DMR Configurations

The final factor to consider which affects initial load only is that of a tailored DMR configuration. There are two main areas to consider:

first, what can be done in generating a tailored DMR, and second, what mode of operation to select: single-thread or multi-thread.

The following are changes which may be made through system generation to achieve a tailored DMR. The fixed table space consists mainly of lists. The main table to be concerned with on initial load is the Block Usage Table. The size of this table should be kept to a minimum, that is, equal to the maximum number of words that can fit in the page at any one time. This list is searched in its entirety everytime a page is referenced and the page is not in core, thus it should be no longer than necessary.

The dynamic table buffer should be only big enough to hold the required record and set description tables, in addition to the area, record, and set reference tables that are permanently resident during the execution of the run unit. Any space saved should be reallocated to the page buffer. The page buffer should hold at least as many pages as are required to perform a store of a record, and its insertion into all the sets in which it participates, with a maximum of one I/O per page referenced, i.e. no swapping of pages required by the command.

A reduction in the core utilization of the DMR may be realized in one of two ways: first, coding in the DMR may be turned off by means of a number of system generation parameters. Also, using segmentation, routines that are not required may either be put in overlayable segments, or may be totally excluded from the DMR.

Turning next to the mode of operation of the DMR, i.e. single-thread of multi-thread, we find there are advantages and disadvantages to be considered in each approach. The major advantages of single thread is that there are no conflicts when requesting facilities, be they internal (such as a core segment) or database (such as a page). No queueing ever takes place. Another advantage of using single thread is that a tailored system for the load is easier to achieve, that is table/page buffer space optimization is simplified, routines not required can be excluded, etc. A third advantage is that the LMJ's as opposed to ER's to LINK$ and EXLINK$ are used when entering or leaving the DMR.

The disadvantages to using a single thread DMR include program size, in that more Executive overhead is involved in loading and swapping large programs (and also the frequency of swapping is higher). However a more important disadvantage is the lack of the system file (use of the free command without pre-initialized pages is thus precluded), causing the overhead previously mentioned regarding multiple looks for a page.

A multi-thread DMR is recommended. First there is only one copy of the DMR, thus, the programs are smaller in size, and therefore not as liable to be swapped. Second, the systems file is available, therefore restarting of initial load can be accomplished with minimal overhead and effort as described earlier. Another advantage of using the multi-thread DMR is that multiple load programs can be executing simultaneously without fear of the data base being jeopardized by overwriting. Also the audit trail capabilities, if required, are available.

The disadvantages of multi-thread are first, that two ER's (LINK$/EXLINK$) per command are executed, and second, the possibility that extra I/O might result from page or segment swapping without the DMR.

AFFECT SUBSEQUENT PROCESSING

Turning now from those factors which affect only the performance of initial load to those factors which also affect subsequent processing as well, I have classified them under two categories: Aread Definition, and Record and Set Definition. Because these factors do affect normal processing the Data Administrator must be prepared to examine each and make a tradeoff decision if the initial load and normal processing requirements are in conflict.

Area Definition

There are a numbr of factors to be considered in the selection of page sizes. Large pages are ideal for initial load and for sequential processing. A balance exists between the page size and buffer size ratio and also the number of concurrent run units allowed. Excessive page thrashing may occur if a balance does not exist. In addition uniform or evenly divisible page sizes for index pointer areas as well as data areas should be used throughout the database, so as to avoid fragmentation of core in the dynamic page buffer and to reduce the overhead in the DMR's core allocation routine.

If index sequential records are present the number of index entries at the lowest level of the index is equal to the number of data pages that have index sequential records after initial load. The number of levels is therefore dependent on both the number of data pages and on how many entries can fit in an index page. A index page size should be selected such that a three level index is not exceeded. In pointer arrays the average length of the array, that is, the number of member records per set occurrence is a key determinent of the pointer area page sizes. In general, the strategy should be to fit an entire array, i.e., a set occurrence, into a pointer page.

Interspersed Overflow should be used whenever possible so that, first, device head movement if applicable is minimized, and second, the time spent searching for space to store records is reduced, as the records going to overflow are spread out through the area, rather than concentrated in one place only, which is the case with global overflow.

Finally, the load factor is very important and its impact on processing cannot be ignored. In a relatively stable area, a load factor of 80% is quite appropriate whereas in a highly volative area, a load factor of 50 to 60% is more desirable. The load factor of a data area where index sequential records are being stored, affects the number of lowest level index entries, and thus the total number of index levels. It is thus a factor in the number of I/O's required to access a record through its index sequential keys. The load factor has no significant impact on the performance of the initial load process per se.

Record and Set Description

When defining records and their relationships, that is, their set memberships, consideration must be given to tradeoffs between a certain amount of data redundancy and the potential I/O associated with a set relationship. A limited amount of redundant data may speed up both the initial load and normal processing.

As an alternative to using a set, particularly where the number of members per occurrence is small, the use of either a single variable length record or one variable length member record, in the set occurrence should be considered. Either approach may save processing time and mass storage space. An example is an employee and its dependents, where the Employee Record is defined as either a variable length record, the variable part being the dependent's data, or the Employee Record is defined as owner and a variable length record, the Department Record, is defined as the member.

I do not recommend that a manual membership be established instead of an automatic membership simply because it is easier for the initial load process. The overhead involved when processing the extra command per record, as well as the overhead in the DMR associated with the internal manipulation of manual pointers, overshadows the only advantage existing at initial load time, i.e., that the owner of the set need not be present. If as previously mentioned under off line loading procedures, a level by level approach to the load is taken, the owners will have been stored first.

Caution is also to be exercised when adding prior and/or owner pointers. There is, I believe, a tendency to establish too many pointers when they are not really needed. The result is additional mass storage utilization. Again a trade off must be made between the space required for the pointers, the overhead involved in establishing them, and the saving in processing time resulting from their presence.

In conclusion I would like to reemphasize that records be sorted and pre-screened for duplicates prior to the initial load and that a unique initial load schema, allowing duplicates and using a set occurrence selection of current of set be implemented. Also, that the FREE command be used in conjunction with non-initialized pages and run unit quick before looks, executing in a multi-thread environment. Thus, the initial load process is borken up, and full use is made of the recovery and restart procedures provided by DMS 1100.

The following represents some additional considerations which NCC might find useful.

- The very nature of loading a data base demands that all development (data) schedules be on time. Slippage of these schedules more likely than not, will call for the need to reload portions of the data base.
- Depending of course on the amount of a data to be loaded on the data base, the user should consider specifying "NO LOOKS". This avoids the I/O overhead associated with audit trails during the load process.

- If the user determines that the volume of data to be loaded is very large, it would be beneficial to use a "test bed" load, which would represent some sub-set of the total data, to "shake down" potential design inefficiencies in the initial data base design.
- The user should attempt to standardize the size of pages throughout the data base.

IV. 4.

PROCEDURES FOR USING MULTIPLE SCHEMAS

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PREFACE

The purpose of this document is to provide the DMS-1100 users with a step-by-step approach on the proper procedures for constructing a DMR to support multiple schemas and constructing the various schemas to be processed by the DMR.

In order for an installation to operate successfully with multiple schemas, it is imperative that the Database Administrator initiate formal procedures for schema/area/record/set naming conventions and enforce those procedures.

Procedures for Using Multiple Schemas

One of the DMS-1100 Level 6R1 enhancements is the option to configure the REP/CDB DMR to permit concurrent access on multiple schemas. While this feature was available under Level 5A, DMS-1100 users were encouraged to operate with one schema whenever possible.

If an installation elects to configure the REP/CDB DMR for multiple schemas, that installation must initially establish strict procedures and subsequently enforce those procedures. The procedures include references to the following DMS-1100 features:

- DMSSGP Parameters
- Area Control Clause
- Schema Naming Conventions
- Area/Record/Set Naming Conventions
- TABLEN Parameters

DMSSGP Parameters

The DMS 6R1 release tape is presently configured to support one schema. That is the DMSSGP parameter settings for SCLLEN and ONESCH are equated to 1. If multiple schemas are to be processed, then those two parameters must be modified to reflect that condition.

- SCLLEN should be equated to the number of schemas that can be invoked in the DMR; e.g. 5
- ONESCH should be equated to zero; i.e. OFF

(Reference: Figure 1)

Area Control Clause

If the REP/CDB DMR is configured for multiple schemas, area control for each of the schemas must be identical.

Area Control is adjusted by the AREA CONTROL clause. The format of the AREA CONTROL clause is:

AREA CONTROL IS integer-1 AREAS

The function of the AREA/CONTROL clause is to specify the maximum number of areas in the database. The AREA CONTROL clause is optional; if used, it must be the first clause following the AREA SECTION clause and must precede all area entries. If the AREA CONTROL clause is present, integer-1 must be a value between 127 and 4000, inclusive. If the AREA CONTROL clause is not present, the assumed value is 4000. The AREA CONTROL clause allows subsequent area entries to be added to the schema without reorganizing the database. The total number of area entries must not exceed the bit limit determined by integer-1. The AREA CONTROL clause affords the Database Administrator a trade-off between an expansion factor for areas and the number of pages allowed per area and the number of records per page. (Reference: Figures 3.1, 4.1, or 5.1)

Schema Naming Conventions

If multiple schemas are used, then the names for each of the schemas must be unique. A schema name is defined to be a DDL word consisting of a contiguous sequence of 1-12 characters. Each character must be from the set 'A,''B',...,'Z','0',...,'9', and'-',and neither the first nor last character in the word can be '-'.

Area/Record/Set Naming Conventions

If multiple schemas are used, then the names for the areas in each of the schemas must be unique. That is, no two schemas may have the same identical area names. Furthermore, the area/record/ set codes for each of the schemas must be unique. That is, no two schemas may contain the same area/record/set codes. Observe that within one schema, while the area/record/set codes must be unique for area/record/set, there may be the same sequence of codes for the areas as for the records and as for the sets. For example, one can have the following:

```
          .
          .
          .
AREA SECTION
AREA NAME IS AREA1
AREA CODE IS 1
          .
          .
          .
AREA NAME IS AREA2
AREA CODE IS 2
          .
          .
          .
RECORD SECTION
RECORD NAME IS RECORD1
RECORD CODE IS 1
          .
          .
          .
RECORD NAME IS RECORD2
RECORD CODE IS 2
          .
          .
          .
SET SECTION
SET NAME IS SET1
SET CODE IS 1
          .
          .
          .
SET NAME IS SET2
SET CODE IS 2
          .
          .
          .
```

Area, Record, and Set names adhere to the same restrictions as Schemas names with the exception that Area names cannot exceed 12 characters while Record and Set names cannot exceed 30 characters. (Reference: Figures 3.1, 4.1, or 5.1)

TABLEN Parameter

The DMS 6R1 release tape is presently configured to support one schema. The DMSSGP parameter setting for TABLEN is equated to 2000 TABLEN represents the length of the dynamic table area of the DMR buffer (IV00). The DMR buffer is logically separated into four different areas; as follows:

- Fixed Table Space
- Dynamic Table Area
- EXEC 8 Page Area
- TIP Page Area

The Dynamic Table Area contains all the reference tables (initialized at IMPART time) and retained in core until no run unit is accessing the schema), description tables (records and sets) and miscellaneous core. It is dynamic in that space within it is allocated as needed, the entries are not all of the same size, and de-allocation is performed (except reference tables) whenever space is required. Essentially, the space is reserved for schema tables (Reference: Figure 2) handling. Space in the area is controlled by a Core Map Table entry. (Reference: Figure 6.1)

If multiple schemas are to be processed, then the Database Administrator must ensure that the Dynamic Table Area must be large enough to contain the schema tables. The LIST processor can be utilized to obtain an octal listing of the object schema. (Reference: Figures 3.2, 4.2, or 5.2) As indicated above, the portions of the object schema are copied into the Dynamic Table Area (Reference: Figure 6.2) as applicable.

The example on the next page illustrates the use of three schemas. Observe that the maximum table length is 1288_{10} words and is computed with the maximum description tables (record and sets) for each schema. In reality, the description tables are copied into the Dynamic Table Area on an as needed basis. The total minimum description table would be computed by adding up the minimum description table per schema. The latter is computed by adding the longest lengths of three record/set description tables.

Error Conditions

001526 The DMR will return a 1526 error (attempt to IMPART when there is insufficient space in AREA/REC/SET REFERENCE LIST to allow all areas, records, or sets to be IMPARTed) if multiple schemas are processed in a DMR not configured to support multiple schemas.

311500 The DMR will return a rollback 31 error (using multiple schemas and number of bits used for area control in this schema differs from that of schema already IMPARTed) if a run unit tries to IMPART using a schema with an AREA CONTROL different from a second schema area in use in the DMR.

IV-4-4-A

__Example__*

1. LIBRARY Database

Schema name: DEMO

Starting Address of DNT	0700
Starting Address of SCD	034
Length of Ref/Desc Tables	0644

2. EDCENTER Database

Schema name: ED-CENTER

Starting Address of DNT	0770
Starting Address of SCD	034
Length of Ref/Desc Tables	0734

3. PROFILE Database

Schema name: PROFILE

Starting Address of DNT	0644
Starting Address of SCD	034
Length of Ref/Desc Tables	0610

The DMSSGP parameter is equated to 2000_{10} or 3720_8 words on the base release tape. Since the record and set description tables are invoked dynamically, the maximum table length requirement for the three schemas is 1288_{10} or 2410_8 words.

When multiple schemas are accessed concurrently, then it is important to @FREE an area after cataloging it. The procedure is:

```
@ASG,CP     areaname
@FREE       areaname
```

or

```
@CAT,CP     areaname
@FREE       areaname
```

* Reference: Figures 3.2, 4.2, and 5.2.

Figure 1: DMSGEN Runstream

TV-4-6(α)

```
@ELT,ILD  DMSFL.T,,ENDFIL
ELT017 RL1B70 04/27-11132:40-(,0)
000001     000     @ASG,T   IN.,16N,91790
000002     000     @DELETE,C F1.
000003     000     @DELETE,C F2.
000004     000     @DELETE,C F3.
000005     000     @DELETE,C F4.
000006     000     @DELETE,C F5.
000007     000     @DELETE,C F6.
000008     000     @DELETE,C F7.
000009     000     @DELETE,C F8.
000010     000     @DELETE,C F9.
000011     000     @DELETE,C F10.
000012     000     @ASG,UP  F1.,F2///2000
000013     000     @ASG,UP  F2.,F2///2000
000014     000     @ASG,UP  F3.,F2///2000
000015     000     @ASG,UP  F4.,F2///2000
000016     000     @ASG,UP  F5.,F2///2000
000017     000     @ASG,UP  F6.,F2///2000
000018     000     @ASG,UP  F7.,F2///2000
000019     000     @ASG,UP  F7.,F2///2000
000020     000     @ASG,UP  F8.,F2///2000
000021     000     @ASG,UP  F9.,F2///2000
000022     000     @ASG,UP  F10.,F2///2000
000023     000     @COPY,G  IN.,F1.
000024     000     @COPY,G   IN.,F2.
000025     000     @COPY,G  IN.,F3.
000026     000     @COPY,G  IN.,F4.
000027     000     @COPY,G  IN.,F5.
000028     000     @COPY,G  IN.,F6.
000029     000     @COPY,G  IN.,F7.
000030     000     @COPY,G  IN.,F8.
000031     000     @COPY,G  IN.,F9.
000032     000     @COPY,G  IN.,F10.
000033     000     @FREE   IN.
000034     000     @ELT,UL   F3.USER365
000035     000     @ASG,UP  TCF.,F2
000036     000     @ELT,IL  TCF.TCF
000037     000     *SGPC
000038     000
000039     000
000040     000
000041     000
000042     000
000043     000     @ADD,P  F3,DMSUP
000044     000     @ASG,T  OUT.,16N,92791
000045     000     @PACK    F1.
000046     000     @PACK    F2.
000047     000     @PACK    F3.
000048     000     @PACK    F4.
000049     000     @PACK    F5.
000050     000     @PACK    F6.
000051     000     @PACK  F7.
000052     000     @PACK    F8.
000053     000     @PACK    F9.
000054     000     @PACK  F10.
000055     000     @COPY,GM   F1.,OUT.
000056     000     @COPY,GM  F2.,OUT.
000057     000     @COPY,GM  F3.,OUT.
000058     000     @COPY,GM  F4.,OUT.
000059     000     @COPY,GM  F5.,OUT.
000060     000     @COPY,GM  F6.,OUT.
000061     000     @COPY,GM  F7.,OUT.
000062     000     @COPY,GM  F6.,OUT.
000063     000     @COPY,GM  F9.,OUT
000064     000     @COPY,GM  F10.,OUT.
END-ELT.

@FIN
```

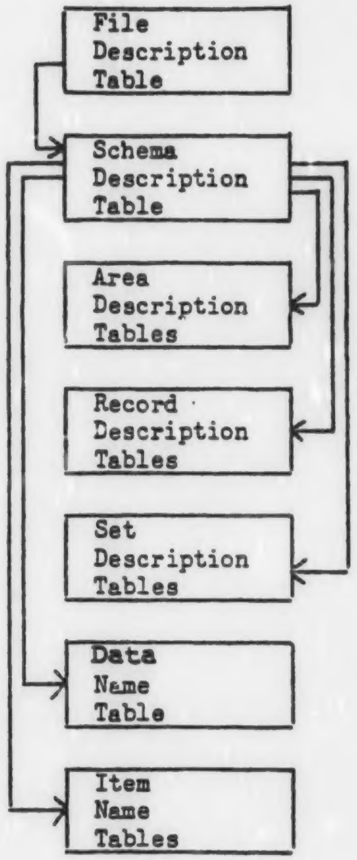
```
-1Ø7,1Ø7
ONESCH      EQU      OFF.
-168,168
SCLLEN      EQU      5.
@EOF
```

Object Schema Tables

Octal Location	Description
034	Start of SCD
037	T1 - DNT length H2 - DNT Sector address
042	Total areas/records/sets
044,045,046	Relative start address of ART/RRT/SRT

Figure 2: **Object Schema Tables**

SCHEMA ELEMENT


File Description Table
Schema Description Table
Area Description Tables
Record Description Tables
Set Description Tables
Data Name Table
Item Name Tables

Object Schema Tables

Octal Location	Description
034	Start of SCD
037	T1 - DNT length H2 - DNT Sector address
042	Total areas/records/sets
044,045,046	Relative start address of ART/RRT/SRT

```
ABSOLUTE ELEMENT ED-CENTER.SCHEMA  -  PRODUCED ON APRIL 28, 1976 AT 09:34:27
DUMP OF FASTRAND STARTING AT 003400  (LENGTH: 034)

00000000  000000 FDT•000000000000   121141101223   311227050505   000000050505   043414103243   000000000000   000000000000   000000000000
00000010  000000     021400000001   000000000000   000000000034   000000000000   000000000000   000000000000   000000000000   000000000000
00000020  000000     000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000
00000030  000000     000000000000   000000000000   000000000000   000000000000  •000000000000   000000000000   000000000000   000100000022
00000040  000001 SCD 000000000000   000000001430   000200040006   000000000000   000000130002   000000330004   000000130006 A1 111700000012
00000050  000001     000000000000   000000000000   000000000000   062712066161   050505050505   003400003325   000012000000   000000000002
00000060  000001 ADT 014400000001 A2 111700000024  000000000000   000000000000   000000000000   062712066262   050505050505   003400003325
00000070  000002    •000012000000   000000000002   014400000001 R1 000000000012  003000000006   000000000000   000000000000   111225062731
00000100  000002     221223310505   050505050505   050505050505   050505050505   003100000024 R2 000000000024  005300000007   000000000000
00000110  000002     000000000000   102106303005   050505050505   050505050505   050505050505   050505050505   006400000025 R3 000000000036
00000120  000002     004600000012   000000000000   000000000000   303132111223  •310505050505   050505050505   050505050505   050505050505
00000130  000003     007400000003 R4 000000000050  003300000011   000000000000   000000000000   162330312732   103124270505   050505050505
00000140  000003     050505050505   050505050505   004000000027 S1 050100000012  001400000014   000000000000   000000000000   111225314110
00000150  000003     210630300505   050505050505   050505050505   050505050505 S2 050100000024  001400000015   000000000000   000000000000
00000160  000004    •102106303041   303132111223   310505050505   050505050506   050505050505 S3 050100000036  001400000016   000000000000
00000170  000004     000000000000   103230312422   122705050505   050505050505   050505050505   050505050505 S4 020100000050  001300000017
00000200  000004     000000000000   000000000000   303106231107   360505050505   050505050505   050505050505   050505050505 S5 050100000062
00000210  000004     001400000020   000000000000   000000000000   111225314116  •233031050505   050505050505   050505050505   050505050505
00000220  000005  S6 050100000074   001400000021   000000000000   000000000000   162330314110   210630300505   050505050505   050505050505
00000230  000005     050505050505   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000
00000240  000005     000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000
00000250  000006 RDT•000000000000   010000150012   000003000002   020000020003   001600000000   002200030000   000000000007   111225062731
00000260  000006     221223310505   050505050505   050505050505   050505050505   000000000000   000000000012   020100010012   000005000000
00000270  000006     020100020062   000005000000   000100000047   000001000000   020202000044   000001000000   020202000003   000001000006
00000300  000006     000000000000   000000000000   000000000000   000000000000  •000000000000   030000200024   000001000000   030200070010
00000310  000007     002100270000   003500070000   000000000011   102106303005   050505050505   050505050505   050505050505   050505050505
00000320  000007     000000000000   112230100621   100505050505   000100030000   000000000012   020100010024   000005000000   020100020034
00000330  000007     000005000000   020200030050   000002010000   030100050012   000005000000   000500000000   030100060074   000005000000
00000340  000010    •000200000000   000100000041   000001000000   020202000036   000011000000   020202000006   000011000005   000200000014
00000350  000010     000001000006   020402000006   000011000006   020402000006   000001000007   020203000001   000001000010   000000000000
00000360  000010     000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000
00000370  000010     000000000000   000000000000   000000000000   000000000000  •000000000000   040000150050   000000000062   010100020003
00000400  000011     001600200000   002300040000   000000000007   162330312732   103124270505   050505050505   050505050505   050505050505
00000410  000011     000000000000   000000000012   020100010074   000005000000   030100020062   000005000000   000200000000   000100000047
00000420  000011     000001000000   020202000036   000011000000   020202000003   000001000005   020202000006   000004000005   000000000000
00000430  000012    •000000000000   040000150036   000000000024   000003020004   000000000016   002600100000   000102000014   303132111223
00000440  000012     310505050505   050505050505   050505050505   050505050505   000000000000   000000000024   030100000024   000005000000
00000450  000012     000200000000   030100000036   000005000000   000200000000   020100000050   000002000000   000100000105   000001000000
00000460  000013     020202000024   000011000000   020202000024   000003000003  •020202000024   000005000006   020202000003   000001000012
00000470  000013     000200000006   000004000012   020402000003   000004000012   020402000003   000001000013   000000000000   000000000000
*********  ******    020 WORDS OF 000000000000 SKIPPED
00000520  000014 SDT•000000000000   010500000012   001201000000   111225314110   210630300505   050505050505   050505050505   050505050505
00000530  000014     002401030102   000000030004   010300000005   010000000000   000000000000   000000000000   000000000000   000000000000
00000540  000014     000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000
00000550  000014     000000000000   000000000000   000000000000   000000000000  •000000000000   010500000024   002401000000   102106303041
00000560  000015     303132111223   310505050505   050505050505   050505050505   003603020102   000000030004   010300000002   020000000000
*********  ******    020 WORDS OF 000000000000 SKIPPED
00000610  000016    •000000000000   010500000036   002401000000   103230312422   122705050505   050505050505   050505050505   050505050505
00000620  000016     003603020102   000000030004   010300000002   010000000000   000000000000   000000000000   000000000000   000000000000
00000630  000016     000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000
00000640  000016     000000000000   000000000000   000000000000   000000000000  •000000000000   010200000050   002401000000   303106231107
00000650  000017     360505050505   050505050505   050505050505   050505050505   003603000002   000000020003   010000000000   000000000000
*********  ******    020 WORDS OF 000000000000 SKIPPED
00000700  000020    •000000000000   010500000062   001201000000   111225314116   233031050505   050505050505   050505050505   050505050505
00000710  000020     005001020102   000000030004   010300000002   010000000000   000000000000   000000000000   000000000000   000000000000
00000720  000020     000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000
00000730  000020     000000000000   000000000000   000000000000   000000000000  •000000000000   010500000074   005001000000   162330314110
00000740  000021     210630300505   050505050505   050505050505   050505050505   002401030102   000000030004   010300000002   020000000000
*********  ******    020 WORDS OF 000000000000 SKIPPED
00000770  000022 IWT•000000000000   000000000000   000000000003   000006000047   000000000000   000000000000   000000000000   000000000000
*********  ******    030 WORDS OF 000000000000 SKIPPED
00001030  000023     000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000307000001
00001040  000023     000641230622   120505050505   000205000002   064120123605   000006000003   064123062212   000000000000   000000000000
00001050  000023     000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000   000000000000
00001060  000024 EWT•000000000000   000000000000   000001000047   000600120001   300300000000   001060610410   000611122506   273122122331
00001070  000024     101677770000   001005110002   300300002006   001060620417   000611122531   412304221200   230110003600   003551636640
00001100  000024     771042777700   000004070003   300300006005   001060620417   000611122531   412324002301   100036000035   516340771042
00001110  000024     777742777700   000000000000   000000000000   000000000000  •000000000000   000000000000   000001000061   000600050001
00001120  000025     300300000000   001060610410   000610210630   301016777701   001005120002   300300003006   001060620417   000610210630
00001130  000025     304123062212   002301100036   000035516360   407710427777   001004100003   300300001006   001060620417   000610210630
00001140  000025     304123240023   011000360000   365164407710   427777427777   000400130004   300300000000   001060620417   000610210630
00001150  000026    •304111063112   301023777700   001004120005   300300003006   001060640420   000630310627   314111063112   002401100041
00001160  000026     000035516640   771045777777   001004100006   300300001006   001060640420   000611231141   110631120024   011000410000
00001170  000026     365164407710   457777777777   000001130007   300300004006   001060620417   000623244113   332724212112   110023011000
```

```
0000|200  000026   [illegible]0000[illegible]10  [illegible]7777[illegible]  0000000000[illegible]  [illegible]0000  [illegible]000000000  [illegible]000000000  [illegible]0100[illegible]  00[illegible]1200[illegible]
0000|210  000027   300300000000  001060610410  000614231031  273210312427  1[illegible]1477771000  001005110002  300300002006  001060620417
0000|220  000027   000616233031  412306221200  230110004300  003551636040  771047777777  000703040003  300300003005  001060620417
0000|230  000027   000611122531  002301100043  000035353577  104777776040  000004130004  300300004006  001060620417  000612222521
0000|240  000030  •243612124123  240023011000  430000355166  407710477777  000000000000  000000000000  000000000000  000000000000
••••••••  ••••••   020 WORDS OF  000000000000  SKIPPED
0000|270  000030   000000000000  000000000000  000000000000  000000000000 •000000000000  000000000000  000001000105  000400070001
0000|300  000031   300300000000  001060610410  000630313211  122331101477  770023011000  001105140002  300300005006  001060620417
0000|310  000031   000630313211  122331412306  221200230110  004100003551  626040771045  777700000000  000705030003  300300002005
0000|320  000031   001060620417  000624271400  230110004100  003551626040  771045777751  001106130004  300300004006  001060620417
0000|330  000032  •000612232724  212112114107  340023011000  410000355142  604077104577  777700000000  000703040005  300300003005
0000|340  000032   001060620417  000624251227  002301100041  000035353577  104577775142  000500060006  300300000000  001060620417
0000|350  000032   000610411024  111210237777  000703050007  300300004005  001060640420  000611122523  240024011000  410000353535
0000|360  000032   771045777762  000003050010  300300004005  001060640420 •000610213023  240024011000  410000353535  771045777762
••••••••  ••••••   030 WORDS OF  000000000000  SKIPPED

@EOF
@EOF IGNORED - IN CONTROL MODE

@BRKPT PRINTS
```

F2-4

```
1234567890123456789012345678901 2.  .5789012345678901234567890123456789012 34567890123456789012345678901234567890123456789012345678 90**SEQ NO. 01
```

TV-4-11

Figure 3: LIBRARY Database

```
@ADD,P LIBRARY3.LIBRARY

@HDG,P

@ASG,T          QUICK-LOOK1.
FACILITY WARNING  100000000000

@ASG,T          QUICK-LOOK2.
FACILITY WARNING  100000000000

@DELETE,C       DEMO.
FURPUR 27R2  RL72R1 09/28/76 09:25:42

@DELETE,C       SUBJECTS.

@DELETE,C       SUBJECTINDEX.

@DELETE,C       LIBRARIES.

@ASG,CP         DEMO.
READY

@FREE           DEMO.
READY

@ASG,CP         SUBJECTS.
READY

@FREE           SUBJECTS.
READY

@ASG,A          SUBJECTS.
READY

@ASG,A          DEMO.
READY

@ASG,CP         SUBJECTINDEX.
READY

@FREE           SUBJECTINDEX.
READY

@ASG,A          SUBJECTINDEX.
READY

@ASG,CP         LIBRARIES.
READY

@FREE           LIBRARIES.
READY

@ASS,A          LIBRARIES.
READY

@ASG,A          DMRNT.
FACILITY WARNING  100000000000
```

```
                                                                          DATE 092076        PAGE    1
@DMRMT.DDL,IBLR  ,DEMO.SCHEMA
DDL TRANSLATOR - LEVEL -
PERFORMED ON APRIL 28, 1976 AT 09125144
     1.  00         IDENTIFICATION DIVISION
     2.  00         SCHEMA NAME IS DEMO
     3.  00         DATA DIVISION
     4.  00         AREA SECTION
     5.  00         AREA LOOKS INCLUDE QUICK-BEFORE-LOOKS
     6.  00              BEFORE-LOOKS AFTER-LOOKS
     7.  00         AREA NAME IS LIBRARIES
     8.  00              AREA CODE IS 101
     9.  00              ALLOCATE 10 PAGES 2 OVERFLOW PAGES
    10.  00              PAGES ARE 1792 WORDS
    11.  00              LOAD IS 75 PERCENT
    12.  00              CALC USES 1 CHAINS
    13.  00         AREA NAME IS SUBJECTS
    14.  00              AREA CODE IS 102
    15.  00              ALLGCATE 20 PAGES 5 OVERFLOW AT END
    16.  00              PAGES ARE 1792 WORDS
    17.  00              LOAD IS 80 PERCENT
    18.  00         AREA NAME IS SUBJECTINDEX
    19.  00              AREA CODE IS 3
    20.  00              MODE IS INDEX AREA
    21.  00              ALLOCATE 3 PAGES
    22.  00              PAGES ARE 112 WORDS
    23.  00         RECORD SECTION
    24.  00         RECORD NAME IS LIBRARY
    25.  00              RECORD CODE IS 101
    26.  00              LOCATION MODE IS DIRECT LIBRARY-KEY LIBRARY-AREA-NAME
    27.  00                   WITHIN LIBRARIES
    28.  00              RECORD MODE IS ASCII
    29.  00              05 LIBRARY-NAME      PIC X(80)
    30.  00         RECORD NAME IS BOOK
    31.  00              RECORD CODE IS 102
    32.  00              LOCATION MODE IS CALC DMSCALC IN BOOK-AREA-NAME
    33.  00                   USING BOOK-NUMBER DUPLICATES ARE NOT ALLOWED
    34.  00                   WITHIN LIBRARIES
    35.  00              RECORD MODE IS ASCII
    36.  00              05 FILLER           PIC X(6)
    37.  00              05 BOOK-NUMBER      PIC 9(6) USAGE DISPLAY
    38.  00              05 BOOK-NAME        PIC X(68)
    39.  00         RECORD NAME IS CHAPT
    40.  00              RECORD CODE IS 103
    41.  00              LOCATION MODE IS VIA BOOK-CHAPT SET
    42.  00                   WITHIN LIBRARIES
    43.  00              RESERVE 1 POINTERS
    44.  00              RECORD MODE IS ASCII
    45.  00              05 CHAPT-NUMBER  PIC 9(6) USAGE DISPLAY
    46.  00              05 CSECTN-NUMBER    PIC X(6)
    47.  00              05 CHAPT-NAME  PIC X(68)
    48.  00         RECORD NAME IS SECTN
    49.  00              RECORD CODE IS 104
    50.  00              LOCATION MODE IS VIA CHAPT-SECTN SET
    51.  00                   WITHIN LIBRARIES
    52.  00              RESERVE 1 POINTERS
    53.  00              RECORD MODE IS ASCII
    54.  00              05 SCHAPT-NUMBER  PIC X(6)
    55.  00              05 SECTN-NUMBER  PIC 9(6) USAGE DISPLAY
    56.  00              05 SECTN-NAME  PIC X(68)
    57.  00         RECORD NAME IS SUBJECT
    58.  00              RECORD CODE IS 105
    59.  00              LOCATION MODE IS INDEX SEQUENTIAL
    60.  00                   USING ASCENDING KEY SUBJECT-NUMBER
    61.  00                   INDEX AREA IS SUBJECTINDEX
    62.  00                   LINKS ARE NEXT
    63.  00                   DUPLICATES ARE NOT ALLOWED
    64.  00                   WITHIN SUBJECTS
    65.  00              RECORD MODE IS ASCII
    66.  00              05   SUBJECT-NUMBER       PIC X(2)
    67.  00              05   SUBJECT-NAME         PIC X(40)
    68.  00         SET SECTION
    69.  00         SET NAME IS LIBRARY-BOOK
    70.  00              SET CODE IS 101
    71.  00              MODE IS CHAIN
    72.  00              ORDER IS SORTED
    73.  00              OWNER IS LIBRARY
    74.  00              MEMBER IS BOOK AUTOMATIC
```

Figure 3.1: LIBRARY Schema

```
 75.  00                 ASCENDING KEY IS BOOK-NUMBER
 76.  00                 DUPLICATES ARE NOT ALLOWED
 77.  00             SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
 78.  00         SET NAME IS BOOK-CHAPT
 79.  00             SET CODE IS 102
 80.  00             MODE IS CHAIN
 81.  00             ORDER IS SORTED
 82.  00             OWNER IS BOOK
 83.  00             MEMBER IS CHAPT AUTOMATIC
 84.  00                 ASCENDING KEY IS CHAPT-NUMBER
 85.  00                 DUPLICATES ARE NOT ALLOWED
 86.  00             SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
 87.  00         SET NAME IS CHAPT-SECTN
 88.  00             SET CODE IS 103
 89.  00             MODE IS CHAIN
 90.  00             ORDER IS SORTED
 91.  00             OWNER IS CHAPT
 92.  00             MEMBER IS SECTN AUTOMATIC
 93.  00                 ASCENDING KEY IS SECTN-NUMBER
 94.  00                 DUPLICATES ARE NOT ALLOWED
 95.  00             SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
 96.  00         SET NAME IS SUBJECT-BOOK
 97.  00             SET CODE IS 104
 98.  00             MODE IS CHAIN
 99.  00             ORDER IS SORTED
100.  00             OWNER IS SUBJECT
101.  00             MEMBER IS BOOK AUTOMATIC LINKED TO OWNER
102.  00                 ASCENDING KEY IS BOOK-NUMBER
103.  00                 DUPLICATES ARE NOT ALLOWED
104.  00             SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
```

```
                              SCHEMA DEMO

                     GENERATED 09:25:44 APRIL 28, 1976
              AREA CONTROL BITS: 12 MAXIMUM NUMBER OF AREAS: 4000
             AVERAGE RECORD DESCRIPTION TABLE LENGTH IN WORDS: 25
             MAXIMUM RECORD DESCRIPTION TABLE LENGTH IN WORDS: 33
               AVERAGE SET DESCRIPTION TABLE LENGTH IN WORDS: 12
               MAXIMUM SET DESCRIPTION TABLE LENGTH IN WORDS: 12
         SCHEMA DESCRIPTION TABLE LENGTH: 1 SEGMENT(S) OF 140 WORDS (EACH)
```

F3-5

```
                                                                                              DATE 042876      PAGE    5

                                                AREA(S) IN THE SCHEMA

       AREA NAME            RECORDS WHICH MAY BE                          DATABASE KEY                                DASG REQUIREMENTS
       ---------            STORED IN THE AREA           AREA  PAGE   MAXIMUM    RECORD    MAXIMUM                 POSITIONS OR TRACKS
                            ------------------           BITS  BITS  PAGE NUMBER  BITS  RECORD NUMBER              ---------    ------
                                                         ----  ----  -----------  ----  -------------

     SUBJECTINDEX               INDEX AREA                12     9      511        15      32767                     1          1
     LIBRARIES                   LIBRARY                  12     9      511        15      32767                     1         10
                                  BOOK
                                  CHART
                                  SECTN
      SUBJECTS                   SUBJECT                  12     9      511        15      32767                     1         20
```

```
                                                                                          DATE 042876        PAGE     6

                                          SET-AREA CROSS REFERENCE TABLE

        SET NAME                       OWNER RECORD                AREA THE SET IS CONTAINED WITHIN      AREA PROTECTION
        --------                    AND MEMBER RECORDS              OR AREA(S) SPANNED BY THE SET        ---------------
                                    ------------------              -----------------------------

        LIBRARY-BOOK                      LIBRARY                             LIBRARIES                QUICK-BEFORE-LOOKS
                                                                                                          BEFORE-LOOKS
                                                                                                          AFTER-LOOKS
                                          BOOK                                LIBRARIES                QUICK-BEFORE-LOOKS
                                                                                                          BEFORE-LOOKS
                                                                                                          AFTER-LOOKS

        BOOK-CHAPT                        BOOK                                LIBRARIES                QUICK-BEFORE-LOOKS
                                                                                                          BEFORE-LOOKS
                                                                                                          AFTER-LOOKS
                                          CHAPT                               LIBRARIES                QUICK-BEFORE-LOOKS
                                                                                                          BEFORE-LOOKS
                                                                                                          AFTER-LOOKS

        CHAPT-SECTN                       CHAPT                               LIBRARIES                QUICK-BEFORE-LOOKS
                                                                                                          BEFORE-LOOKS
                                                                                                          AFTER-LOOKS
                                          SECTN                               LIBRARIES                QUICK-BEFORE-LOOKS
                                                                                                          BEFORE-LOOKS
                                                                                                          AFTER-LOOKS

        SUBJECT-BOOK                      SUBJECT                             SUBJECTS                 QUICK-BEFORE-LOOKS
                                                                                                          BEFORE-LOOKS
                                                                                                          AFTER-LOOKS
                                          BOOK                                LIBRARIES                QUICK-BEFORE-LOOKS
                                                                                                          BEFORE-LOOKS
                                                                                                          AFTER-LOOKS
```

F3-7

```
                                        RECORD LIBRARY

                          AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                         LIBRARIES

                                    RECORD LENGTH IN WORDS
                                  CONTROL     DATA     TOTAL
                                  -------     ----     -----
                                     2         20       22

                                      1 OWNER POINTER(S)

             SET PARTICIPATION           POINTERS          LOCATION CRITERIA AS AN OWNER
             -----------------           --------          -----------------------------
               LIBRARY-BOOK                NEXT             ESTABLISH A CURRENT OF THIS SET
                                                         THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                          OF THE OWNER OR OF ANY MEMBER RECORD.
                                                          CURRENT OF SET SPECIFIED IN SOS CLAUSE
                                                                   OF MEMBER BOOK

                            PATHS BY WHICH THE RECORD MAY BE LOCATED
                            ----------------------------------------

            PRIME
            -----
       LIBRARY-AREA-NAME
         LIBRARY-KEY
FOR DIRECT LOCATION MODE OF TYPE
           LIBRARY
```

TV-4-19

```
                                        RECORD BOOK

                    AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                        LIBRARIES

                                  RECORD LENGTH IN WORDS
                                 CONTROL     DATA    TOTAL
                                 -------     ----    -----
                                    6         20      26

                                   1 OWNER POINTER(S)
                                 3 AUTOMATIC POINTER(S)
                                   1 CALC POINTER(S)

     SET PARTICIPATION          POINTERS          LOCATION CRITERIA AS A MEMBER
     -----------------          --------          -----------------------------
       LIBRARY-BOOK               NEXT                    BOOK-NUMBER
       (AUTOMATIC)                                      (ASCENDING KEY)

       SUBJECT-BOOK               NEXT                    BOOK-NUMBER
       (AUTOMATIC)                OWNER                 (ASCENDING KEY)

     SET PARTICIPATION          POINTERS          LOCATION CRITERIA AS AN OWNER
     -----------------          --------          -----------------------------
        BOOK-CHAPT                NEXT             ESTABLISH A CURRENT OF THIS SET
                                               THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                OF THE OWNER OR OF ANY MEMBER RECORD.
                                                CURRENT OF SET SPECIFIED IN SOS CLAUSE
                                                          OF MEMBER CHAPT

                            PATHS BY WHICH THE RECORD MAY BE LOCATED
                            ----------------------------------------

          PRIME                        ALTERNATE                            ALTERNATE
          -----                        ---------                            ---------
                                VIA SET LIBRARY-BOOK                 VIA SET SUBJECT-BOOK
      BOOK-AREA-NAME
       BOOK-NUMBER           ESTABLISH A CURRENT OF SET           ESTABLISH A CURRENT OF SET
FOR CALC LOCATION MODE OF TYPE      LIBRARY-BOOK                         SUBJECT-BOOK
          BOOK          THE CURRENT OF SET MAY BE AN OCCURRENCE THE CURRENT OF SET MAY BE AN OCCURRENCE
                                  OF OWNER LIBRARY                     OF OWNER SUBJECT
                                OR OF ANY MEMBER TYPE                OR OF ANY MEMBER TYPE
```

DATE 476

BOOK-NUMBER
(ASCENDING KEY)
FOR BOOK
FOR LOCATION VIA SET
LIBRARY-BOOK

BOOK-NUMBER
(ASCENDING KEY)
FOR BOOK
FOR LOCATION VIA SET
SUBJECT-BOOK

F3-10

```
                                   RECORD CHAPT

                     AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                     LIBRARIES

                                 RECORD LENGTH IN WORDS
                                 CONTROL    DATA    TOTAL
                                 -------    ----    -----
                                    5        20      25

                                  1 OWNER POINTER(S)
                                 1 AUTOMATIC POINTER(S)
                               1 RESERVED MANUAL POINTER(S)

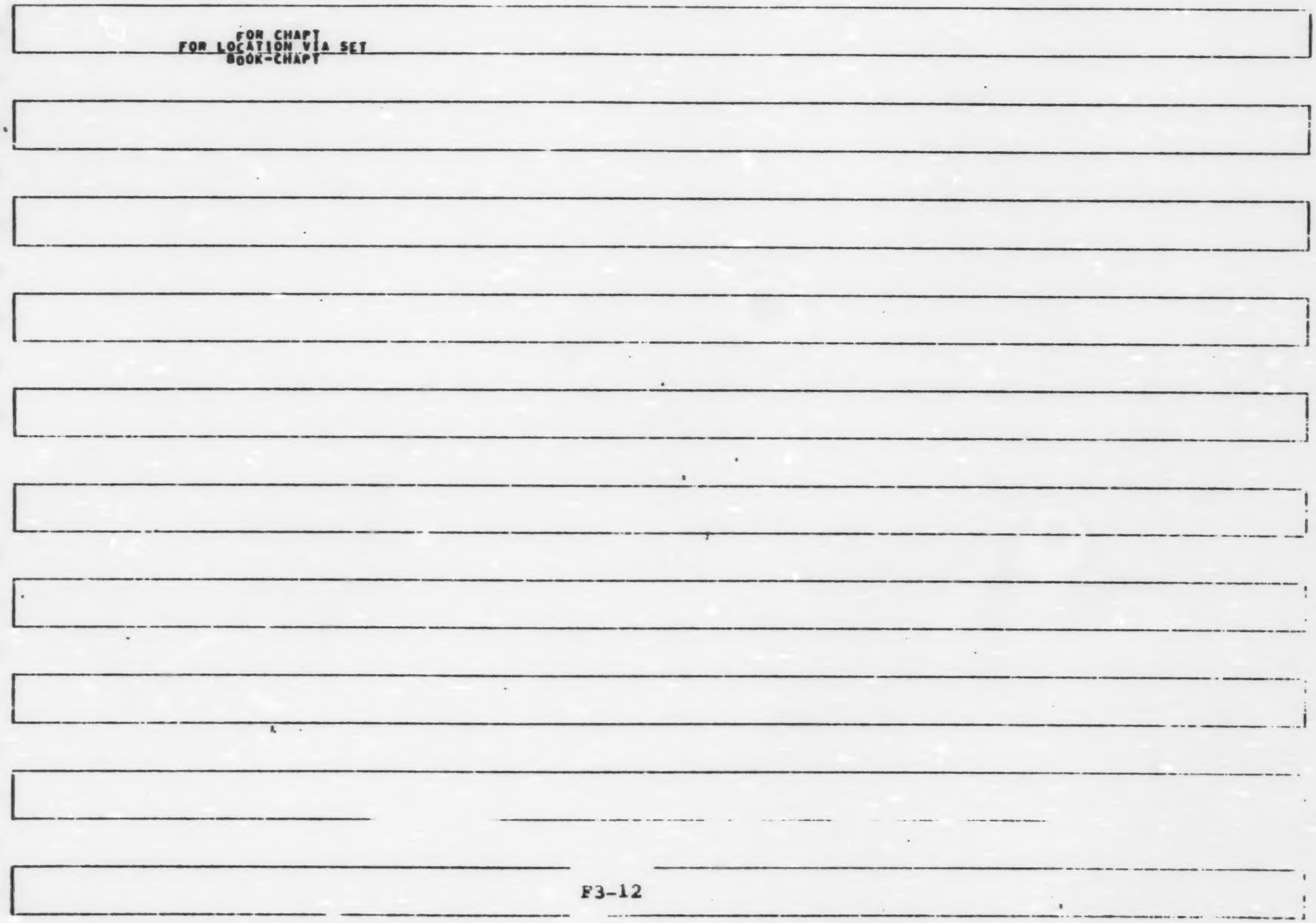
           SET PARTICIPATION          POINTERS          LOCATION CRITERIA AS A MEMBER
           -----------------          --------          -----------------------------
              BOOK-CHAPT                NEXT                     CHAPT-NUMBER
             (AUTOMATIC)                                       (ASCENDING KEY)

           SET PARTICIPATION          POINTERS          LOCATION CRITERIA AS AN OWNER
           -----------------          --------          -----------------------------
              CHAPT-SECTN               NEXT           ESTABLISH A CURRENT OF THIS SET
                                                     THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                      OF THE OWNER OR OF ANY MEMBER RECORD.
                                                      CURRENT OF SET SPECIFIED IN SOS CLAUSE
                                                                OF MEMBER SECTN

                           PATHS BY WHICH THE RECORD MAY BE LOCATED
                           ----------------------------------------

           PRIME
           -----
      VIA SET BOOK-CHAPT
    ESTABLISH A CURRENT OF SET
            BOOK-CHAPT
THE CURRENT OF SET MAY BE AN OCCURRENCE
          OF OWNER BOOK
      OR OF ANY MEMBER TYPE

           CHAPT-NUMBER
          (ASCENDING KEY)
```


FOR CHAPT
FOR LOCATION VIA SET
BOOK-CHAPT

F3-12

```
                                        RECORD SECTN

                          AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                         LIBRARIES

                                  RECORD LENGTH IN WORDS
                                  CONTROL    DATA   TOTAL
                                  -------    ----   -----
                                        4      20      24

                                  1 AUTOMATIC POINTER(S)
                                 1 RESERVED MANUAL POINTER(S)

           SET PARTICIPATION            POINTERS         LOCATION CRITERIA AS A MEMBER
           -----------------            --------         -----------------------------
             CHAPT-SECTN                  NEXT                   SECTN-NUMBER
             (AUTOMATIC)                                        (ASCENDING KEY)

                              PATHS BY WHICH THE RECORD MAY BE LOCATED
                              ----------------------------------------

        PRIME
        -----
   VIA SET CHAPT-SECTN

 ESTABLISH A CURRENT OF SET
        CHAPT-SECTN
THE CURRENT OF SET MAY BE AN OCCURRENCE
      OF OWNER CHAPT
   OR OF ANY MEMBER TYPE

       SECTN-NUMBER
     (ASCENDING KEY)
        FOR SECTN
  FOR LOCATION VIA SET
       CHAPT-SECTN
```

```
                                                                                    DA1. ..287.

                                              RECORD SUBJECT

                              AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                              SUBJECTS

                                         RECORD LENGTH IN WORDS
                                        CONTROL     DATA     TOTAL
                                        -------     ----     -----
                                           3         11       14

                                          1 OWNER POINTER(S)
                                    1 INDEX SEQUENTIAL POINTER(S)
                                         INDEX ENTRY 1 WORDS

              SET PARTICIPATION         POINTERS          LOCATION CRITERIA AS AN OWNER
              -----------------         --------          -----------------------------
                SUBJECT-BOOK              NEXT           ESTABLISH A CURRENT OF THIS SET
                                                      THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                      OF THE OWNER OR OF ANY MEMBER RECORD.
                                                      CURRENT OF SET SPECIFIED IN SOS CLAUSE
                                                                OF MEMBER BOOK

                                   PATHS BY WHICH THE RECORD MAY BE LOCATED
                                   ----------------------------------------

            PRIME
            -----

          SUBJECT-NUMBER
        ASCENDING KEY(S)
   FOR INDEX SEQUENTIAL LOCATION
          MODE OF TYPE
            SUBJECT
        USING INDEX AREA
          SUBJECTINDEX
```

F3-14

```
@SYS$.ALTLIBS.LIST,A0 DEMO.SCHEMA
ITID-002
```

F3-15

```
ABSOLUTE ELEMENT DEMO.SCHEMA  -  PRODUCED ON APRI[illegible] 20, 1976 AT 09:25:44

DUMP OF FASTRAND STARTING AT 003400  (LENGTH: 032)

00000000  000000 FDT •000000000000  111222240505  050505050505  000000050505  043414102230  000000000000  000000000000  000000000070
00000010  000000      021400000001  000000000000  000000000032  000000000000  000000000000  000000000000  000000000000  000000000000
00000020  000000      000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
00000030  000000      000000000000  000000000000  000000000000  000000000000 •000000000000  000000000000  000000000000  006200000020
00000040  000001 SCD  000000000000  000000001430  000300050004  000000000000  000000130003  000000540005  000001130024 A1 111700000003
00000050  000001      000000000000  000000000000  000000000100  303207171210  311623111235  000160033375  000000300000  [illegible]
00000060  000001 ADT  014407000000 A2 111700000145  000000000000  000000000000  000000000000  211607270627  161230050505  003400003325
00000070  000002     •000012000000  000000000002  011307000001 A3 111700000146  000000000000  000000000000  000000000000  303207171210
00000100  000002      313405050505  003400003325  000024000000  000000000005  012007000001 A1 000100000145  002400000005  [illegible]
00000110  000002      000000000000  211607270627  363505050505  050505050505  050505050505  050505050505  002200000022 A2 000160000146
00000120  000002      004100000007  000000000000  000000300000  072424200505 •050505050505  050505050505  050505050505  050505050505
00000130  000003      004100000023  000100000147  003300000011  000000000000  000000000000  101506253105  050505050505  050505050505
00000140  000003      050505050505  050505050505  004300000025 A4 000100000150  003100000012  000000000000  000000000000  301210312305
00000150  000003      050505050505  050505050505  050505050505  050505050505  004300000027  000100000151  002700000013  000000000000
00000160  000004     •000000000000  303207171210  310505050505  050505050505  050505050505  050505050505  003300000031  050100000145
00000170  000004      001400000014  000000000000  000000000000  211607270627  364107242470  050505050505  050505050505  [illegible]
00000200  000004      050100000146  001400000015  000000000000  000000000000  072424204110  150625310505  050505050505  [illegible]
00000210  000004      050505050505  050100000147  001400000016  000000000000 •000000000000  101506253141  301210312305  [illegible]
00000220  000005      050505050505  050505050505  050100000150  001400000017  000000000000  000000000000  303207171210  314107242420
00000230  000005      050505050505  050505050505  050505050505  000000000000  000000000000  000000000000  000000000000  000000000000
00000240  000005      000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  [illegible]
00000250  000006 ADT •000000000000  010000150145  000002000003  010000010002  001200000004  000200020000  000000000024  211607270627
00000260  000006      340505050505  050505050505  050505050505  050505050505  000000050000  000000000145  021000010145  [illegible]
00000270  000006      000100000170  000001000000  070502000120  000001000000  000000000000  000000000000  000000000003  [illegible]
00000300  000006      000000000000  000000000000  000000000000  000000000000 •000000000000  030000200146  000001000000  010200050026
00000310  000007      002100230000  003100040000  000000000024  072424200505  050505050505  050505050505  050505050505  050505050505
00000320  000007      000000000000  112230100621  100505050505  000100000000  000000000145  020100010146  000000500000  030100020145
00000330  000007      000000500000  000300000000  030200030150  000005020000  000300000030  000100000170  000001000050  070507000306
00000340  000010     •000001000000  070503000006  000013000001  070502000104  000001000003  000000000006  000000000000  [illegible]
•••••••• ••••••       020 WORDS OF 000000000000 SKIPPED
00000370  000010      000000000000  000000000000  000000000000  000000000000 •000000000000  040000150147  000000000146  [illegible]
00000400  000011      001600200000  002300040000  000301000024  101506253105  050505050505  050505050505  050505050505  [illegible]
00000410  000011      000000000000  000000000145  020100010147  000005000000  030100020146  000005000000  000200000000  [illegible]
00000420  000011      000001000000  070503000006  000011000000  070502000006  000003000001  070502000104  000001000003  [illegible]
00000430  000012     •000000000000  040000150150  000000000147  000100020004  000000160000  002100040000  000201000024  301210312305
00000440  000012      050505050505  050505050505  050505050505  050505050505  000000000000  000000000145  030100010147  [illegible]
00000450  000012      000300000000  000100000170  000001000000  070502000004  000001000030  070503000004  000013000001  [illegible]
00000460  000012      000001000003  000000000000  000000000000  000100000000 •000000000000  050500160151  002000000003  [illegible]
00000470  000013      001700000000  002100030001  000000000013  303207171210  310505050505  050505050505  050505050505  [illegible]
00000500  000013      000001000000  000100020000  000000000146  020100010150  000005000000  000100000077  000001000000  [illegible]
00000510  000013      000011000000  070502000050  000003000000  000000000000  000000000000  000000000000  000000000000  [illegible]
00000520  000014 SDT •000000000000  010500000145  014501000000  211607270627  364107242420  050505050505  050505050505  [illegible]
00000530  000014      014601010102  000000030004  010300000003  010000000000  000000000000  000000000000  000000000000  000000000000
00000540  000014      000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
00000550  000014      000000000000  000000000000  000000000000  000000000000 •000000000000  010500000146  014601000000  072424204110
00000560  000015      150625310505  050505050505  050505050505  050505050505  014701030102  050000030004  010300000002  [illegible]
•••••••• ••••••       020 WORDS OF 000000000000 SKIPPED
00000610  000016     •000000000000  010500000147  014701000000  101506253141  301210312305  050505050505  050505050505  [illegible]
00000620  000016      015001030102  000000030004  010300000003  010000000000  000000000000  000000000000  000000000000  [illegible]
00000630  000016      000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  [illegible]
00000640  000016      000000000000  000000000000  000000000000  000000000000 •000000000000  010500000150  015101000000  303207171210
00000650  000017      314107242420  050505050505  050505050505  050505050505  014602030102  000000030004  010300000003  010000000000
•••••••• ••••••       020 WORDS OF 000000000000 SKIPPED
00000700  000020 DNT •000000000000  000000000000  000000000003  000000000000  000007000047  000000000000  000000000003  [illegible]
00000710  000020      000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000021000053  [illegible]
•••••••• ••••••       020 WORDS OF 000000000000 SKIPPED
00000740  000021      000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  [illegible]
00000750  000021      072424204106  271205412306  221205050505  000421000002  211607270627  364106271206  412306271205  [illegible]
00000760  000021      211607270627  364120123405  000000000000  000000000000  000000000000  000000000000  000000000000  [illegible]
00000770  000022 INT •000000000000  000000000000  000000100170  000600070001  300300000000  001040410410  000062110727  [illegible]
00001000  000022      770030007000  000005140002  300300005006  001040650414  000621160727  062736412306  221230170110  003370003551
00001010  000022      736043771043  777700000000  000000000000  000000000000  000000000000  000000000000  000000000000  [illegible]
00001020  000022      000070000000  000000000000  000000001000  000000000000 •000000000000  000000000000  000001300170  [illegible]
00001030  000023      300300000000  001040610410  000407242420  101677772306  000774000002  000001605304  [illegible]  [illegible]
00001040  000023      003400003551  664077104077  773700003551  101204130003  [illegible]  [illegible]  [illegible]  [illegible]
00001050  000023      270017011000  340000715166  407700400113  004552011053  777700000004  000065110004  300300002006  [illegible]
00001060  000024     •000407242420  412306221700  170110003400  003551467040  771040777713  000000000000  000000000000  000000000000
•••••••• ••••••       020 WORDS OF 000000000000 SKIPPED
00001110  000024      000000000000  000000000000  000000000000  000000000000 •000000000000  000000000000  000001000170  [illegible]
00001120  000025      300300000500  001040610410  006410150425  311016777700  001254140062  330300075006  [illegible]  [illegible]
00001130  000025      314123322207  122700170110  003500007151  [illegible]  130346020110  547777000006  [illegible]  [illegible]
00001140  000025      031046650414  000610301210  312341233222  071227001701  100303700035  516640771043  777746020110  [illegible]
00001150  000026     •306300003006  001040650414  000610150425  314123062212  001701100033  000035516670  407710377777  [illegible]
•••••••• ••••••       020 WORDS OF 000000000000 SKIPPED
```

Figure 3.2: LIBRARY Object Schema

```
00001200  000026    000000000000  000000000000  000000000000  000000000000 *000000000000  000000000000  000001000170  000500050001
00001210  000027    300300000000  001060610410  000630121031  231016777712  001109150002  300300004006  001060650414  000630101506
00001220  000027    253141233222  071227001701  100036000035  516640771042  777746020110  001204140003  300300075006  001060650414
00001230  000027    000630121031  234123322207  122700170110  003500007151  664077004101  130046020110  547777000000  000005120004
00001240  000030   *300300003006  001060650414  000630121031  234123062212  001701100033  000035516670  407710377777  000000000000
********  ******    020 WORDS OF 000000000000 SKIPPED
00001270  000030    000000000000  000000000000  000000000000  000000000000 *000000000000  000000000000  000001000077  000600070001
00001300  000031    300300000000  001060610410  000630320717  121031101677  771701100033  001104160002  300300001007  001060650414
00001310  000031    000630320717  121031412332  220712270020  011000420000  355162407710  467777020110  000005140003  300300005006
00001320  000031    001060650414  000630320717  121031412306  221200200110  004200003551  640040771046  777777020110  051623163116

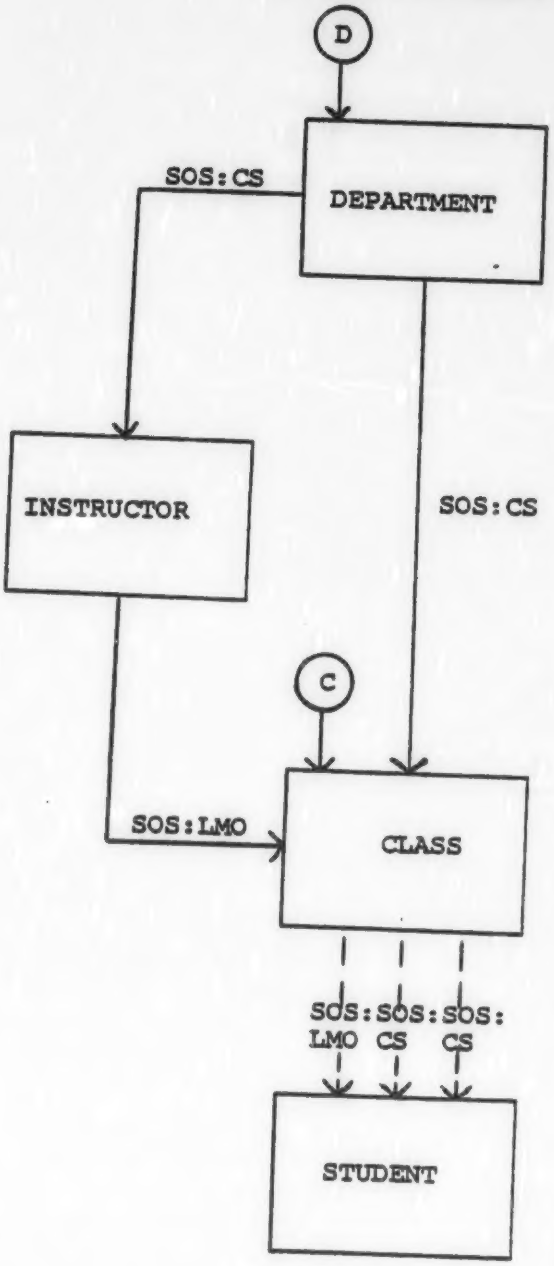
@EOF
@EOF IGNORED - IN CONTROL MODE

@BRKPT PRINTS
```

F3-17

Figure 4: EDCENTER Database

EDCENTER DATABASE


D
DEPARTMENT
SOS:CS
INSTRUCTOR
SOS:CS
C
SOS:LMO
CLASS
SOS:
LMO
SOS:
CS
SOS:
CS
STUDENT

```
@ADD,P EDCENTER.EDCENTER

@DELETE,C ED-CENTER.
FURPUR 27R2  RL72R1 09/28/76 09:39:25

@ASG,UP ED-CENTER.
READY
```

F4-2

```
GDNRMT,DDL,IBLR   ,ED-CENTER,SCHEMA
DDL TRANSLATOR - LEVEL -
PERFORMED ON APRIL 28, 1976 AT 09134127
   1.  00         IDENTIFICATION DIVISION
   2.  00         SCHEMA NAME IS ED-CENTER
   3.  00         DATA DIVISION
   4.  00         AREA SECTION
   5.  00         AREA NAME IS AREA11
   6.  00                 AREA CODE IS 10
   7.  00                 ALLCCATE 10 PAGES 2 OVERFLOW PAGES
   8.  00                 PAGES ARE 1792 WORDS
   9.  00         AREA NAME IS AREA22
  10.  00                 AREA CODE IS 20
  11.  00                 ALLOCATE 10 PAGES 2 OVERFLOW PAGES
  12.  00                 PAGES ARE 1792 WORDS
  13.  00         RECORD SECTION
  14.  00         RECORD NAME IS DEPARTMENT
  15.  00                 RECORD CODE IS 10
  16.  00                 LOCATION MODE IS DIRECT A-KEY A-NAME
  17.  00                 WITHIN AREA11
  18.  00                 02  DEPT-NAME   PIC X(36)
  19.  00                 02  DEPT-NO     PIC X(3)
  20.  00         RECORD NAME IS CLASS
  21.  00                 RECORD CODE IS 20
  22.  00                 LOCATION MODE IS CALC DMSCALC
  23.  00                  IN AA-NAME USING CLASS-NO
  24.  00                  DUPLICATES ARE NOT ALLOWED
  25.  00                 WITHIN AREA11
  26.  00                 02  CLASS-NAME PIC X(30)
  27.  00                 02  CLASS-NO   PIC X(6)
  28.  00                 02  CLASS-DATES
  29.  00                  04  START-DATE    PIC X(6)
  30.  00                  04  END-DATE      PIC X(6)
  31.  00                 02  NO-ENROLLED       PIC 9
  32.  00         RECORD NAME IS INSTRUCTOR
  33.  00                 RECORD CODE IS 40
  34.  00                 LOCATION MODE IS VIA DEPT-INST SET
  35.  00                 WITHIN AREA11
  36.  00                 02  INST-NAME         PIC X(30)
  37.  00                 02  DEPT              PIC XXX
  38.  00                 02  EMPLOYEE-NO       PIC X(6)
  39.  00         RECORD NAME IS STUDENT
  40.  00                 RECORD CODE IS 30
  41.  00                 LOCATION MODE IS VIA CLASS-STUDENT SET
  42.  00                 WITHIN AREA22
  43.  00                 RESERVE 2 POINTERS
  44.  00                 02  STUDENT-NAME  PIC X(20)
  45.  00                 02  ORG           PIC X(20)
  46.  00                 02  ENROLLED-BY   PIC X(20)
  47.  00                 02  OPER          PIC XXX
  48.  00                 02  C-CODE
  49.  00                  04  DEPNO        PIC XXX
  50.  00                  04  CLSNO        PIC XXX
  51.  00         SET SECTION
  52.  00         SET NAME IS DEPT-CLASS
  53.  00                 SET CODE IS 10
  54.  00                 MODE IS CHAIN
  55.  00                 ORDER IS SORTED
  56.  00                 OWNER IS DEPARTMENT
  57.  00                 MEMBER IS CLASS AUTOMATIC
  58.  00                 ASCENDING KEY IS START-DATE
  59.  00                 DUPLICATES ARE NOT ALLOWED
  60.  00                 SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
  61.  00         SET NAME IS CLASS-STUDENT
  62.  00                 SET CODE IS 20
  63.  00                 MODE IS CHAIN
  64.  00                 ORDER IS SORTED
  65.  00                 OWNER IS CLASS
  66.  00                 MEMBER IS STUDENT MANUAL
  67.  00                 ASCENDING KEY IS STUDENT-NAME
  68.  00                 DUPLICATES ARE LAST
  69.  00                 SET OCCURRENCE SELECTION IS THRU LOCATION MODE OF OWNER
  70.  00         SET NAME IS CUSTOMER
  71.  00                 SET CODE IS 30
  72.  00                 MODE IS CHAIN
  73.  00                 ORDER IS SORTED
  74.  00                 OWNER IS CLASS
```

F gure 4.1: EDCENTER Schema

```
 75.  00              MEMBER IS STUDENT MANUAL
 76.  00              ASCENDING KEY IS STUDENT-NAME
 77.  00              DUPLICATES ARE LAST
 78.  00              SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
 79.  00         SET NAME IS STANDBY
 80.  00              SET CODE IS 90
 81.  00              MODE IS CHAIN
 82.  00              ORDER IS LAST
 83.  00              OWNER IS CLASS
 84.  00              MEMBER IS STUDENT MANUAL
 85.  00              SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
 86.  00         SET NAME IS DEPT-INST
 87.  00              SET CODE IS 50
 88.  00              MODE IS CHAIN
 89.  00              ORDER IS SORTED
 90.  00              OWNER IS DEPARTMENT
 91.  00              MEMBER IS INSTRUCTOR AUTOMATIC
 92.  00              ASCENDING KEY IS INST-NAME
 93.  00              DUPLICATES ARE LAST
 94.  00            SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
 95.  00         SET NAME IS INST-CLASS
 96.  00              SET CODE IS 60
 97.  00              MODE IS CHAIN
 98.  00              ORDER IS SORTED
 99.  00              OWNER IS INSTRUCTOR
100.  00              MEMBER IS CLASS AUTOMATIC
101.  00              ASCENDING KEY IS CLASS-NAME
102.  00              DUPLICATES ARE NOT ALLOWED
103.  00              SET OCCURRENCE SELECTION IS THRU LOCATION MODE OF OWNER
```

F4-4

```
SCHEMA ED-CENTER

GENERATED 09:34:27 APRIL 28, 1976
AREA CONTROL BITS: 12 MAXIMUM NUMBER OF AREAS: 4000
AVERAGE RECORD DESCRIPTION TABLE LENGTH IN WORDS: 33
MAXIMUM RECORD DESCRIPTION TABLE LENGTH IN WORDS: 43
AVERAGE SET DESCRIPTION TABLE LENGTH IN WORDS: 11
MAXIMUM SET DESCRIPTION TABLE LENGTH IN WORDS: 12
SCHEMA DESCRIPTION TABLE LENGTH: 1 SEGMENT(S) OF 140 WORDS (EACH)
```

F4-5

```
                                        AREA(S) IN THE SCHEMA

   AREA-NAME           RECORDS WHICH MAY BE                         DATABASE-KEY                              DBSG-REQUIREMENTS
   ---------                                                        ------------                              -----------------
                       STORED IN THE AREA           AREA   PAGE   MAXIMUM      RECORD     MAXIMUM          POSITIONS OR TRACKS
                       ------------------                                                                  ---------    ------
                                                    BITS   BITS   PAGE-NUMBER  BITS       RECORD-NUMBER
                                                    ----   ----   -----------  ------     -------------

     AREA11               DEPARTMENT                 12      9        511        15          32767               1          10
                            CLASS
                          INSTRUCTOR

     AREA22               STUDENT                    12      9        511        15          32767               1          10
```

F4-6

```
                              SET-AREA CROSS REFERENCE TABLE

     SET-NAME                  OWNER RECORD          AREA-THE-SET-IS-CONTAINED-WITHIN   AREA-PROTECTION
     --------               AND MEMBER RECORDS        OR AREA(S) SPANNED BY THE SET     ---------------
                            ------------------        -----------------------------

    DEPT-CLASS                  DEPARTMENT                       AREA11                     NO-LOOKS
                                  CLASS                          AREA11                     NO-LOOKS

   CLASS-STUDENT                  CLASS                          AREA11                     NO-LOOKS
                                 STUDENT                         AREA22                     NO-LOOKS

     CUSTOMER                     CLASS                          AREA11                     NO-LOOKS
                                 STUDENT                         AREA22                     NO-LOOKS

     STANDBY                      CLASS                          AREA11                     NO-LOOKS
                                 STUDENT                         AREA22                     NO-LOOKS

    DEPT-INST                   DEPARTMENT                       AREA11                     NO-LOOKS
                                INSTRUCTOR                       AREA11                     NO-LOOKS

    INST-CLASS                  INSTRUCTOR                       AREA11                     NO-LOOKS
                                  CLASS                          AREA11                     NO-LOOKS
```

```
                                        RECORD DEPARTMENT

                              AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                                AREA11

                                      RECORD LENGTH IN WORDS
                                      CONTROL     DATA     TOTAL
                                      -------     ----     -----
                                         3          7        10
                                         2 OWNER POINTER(S)

               SET PARTICIPATION                POINTERS           LOCATION CRITERIA AS AN OWNER
               -----------------                --------           -----------------------------
                   DEPT-CLASS                     NEXT               ESTABLISH A CURRENT OF THIS SET
                                                                 THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                                  OF THE OWNER OR OF ANY MEMBER RECORD.
                                                                  CURRENT OF SET SPECIFIED IN SOS CLAUSE
                                                                            OF MEMBER CLASS

                   DEPT-INST                      NEXT               ESTABLISH A CURRENT OF THIS SET
                                                                 THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                                  OF THE OWNER OR OF ANY MEMBER RECORD.
                                                                  CURRENT OF SET SPECIFIED IN SOS CLAUSE
                                                                          OF MEMBER INSTRUCTOR

                                 PATHS BY WHICH THE RECORD MAY BE LOCATED
                                 ----------------------------------------

            PRIME
            -----
           A-NAME
           A-KEY
FOR DIRECT LOCATION MODE OF TYPE
          DEPARTMENT
```

F4-8

```
                                        RECORD CLASS

                     AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                         AREA1

                                 RECORD LENGTH IN WORDS
                                CONTROL    DATA    TOTAL
                                -------    ----    -----
                                   8         9       17

                                   4 OWNER POINTER(S)
                                 2 AUTOMATIC POINTER(S)
                                   1 CALC POINTER(S)

        SET PARTICIPATION          POINTERS          LOCATION CRITERIA AS A MEMBER
        -----------------          --------          -----------------------------
           DEPT-CLASS                NEXT                      START-DATE
          (AUTOMATIC)                                       (ASCENDING-KEY)

           INST-CLASS                NEXT                      CLASS-NAME
          (AUTOMATIC)                                       (ASCENDING-KEY)

        SET PARTICIPATION          POINTERS          LOCATION CRITERIA AS AN OWNER
        -----------------          --------          -----------------------------
          CLASS-STUDENT              NEXT          REFER TO PRIME PATH FOR THIS RECORD
                                                   (LOCATION MODE OF OWNER SPECIFIED IN
                                                          SOS CLAUSE OF MEMBER
                                                                STUDENT
                                                    BUT NO ALIAS/USING KEYS SPECIFIED)

            CUSTOMER                 NEXT             ESTABLISH A CURRENT OF THIS SET
                                                 THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                  OF THE OWNER OR OF ANY MEMBER RECORD,
                                                  CURRENT OF SET SPECIFIED IN SOS CLAUSE
                                                           OF MEMBER STUDENT

            STANDBY.                 NEXT             ESTABLISH A CURRENT OF THIS SET
                                     PRIOR       THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                  OF THE OWNER OR OF ANY MEMBER RECORD,
                                                  CURRENT OF SET SPECIFIED IN SOS CLAUSE
                                                           OF MEMBER STUDENT








                                          P4-9
                                         RECORD CLASS

                         PATHS BY WHICH THE RECORD MAY BE LOCATED
                         ========================================

          PRIME                         ALTERNATE                                ALTERNATE
          =====                         =========                                =========
                                   VIA SET DEPT-CLASS                        VIA SET INST-CLASS
         AA-NAME
         CLASS-NO                ESTABLISH A CURRENT OF SET               ESTABLISH A CURRENT OF SET
FOR CALC LOCATION-MODE OF TYPE           DEPT-CLASS                               DEPT-INST
          CLASS          THE CURRENT OF SET MAY BE AN OCCURRENCE  THE CURRENT OF SET MAY BE AN OCCURRENCE
                                 OF OWNER DEPARTMENT                      OF OWNER DEPARTMENT
                                OR OF ANY MEMBER TYPE                    OR OF ANY MEMBER TYPE

                                      START-DATE                               INST-NAME
                                   (ASCENDING KEY)                          (ASCENDING KEY)
                                      FOR CLASS                             FOR INSTRUCTOR
                                FOR LOCATION VIA SET                     FOR LOCATION VIA SET
                                      DEPT-CLASS                               DEPT-INST

                                                                               CLASS-NAME
                                                                            (ASCENDING KEY)
                                                                               FOR CLASS
                                                                         FOR LOCATION VIA SET
                                                                               INST-CLASS
```

F4-10

```
                                         RECORD STUDENT

                         AREA(S) IN WHICH THE RECORD MAY EE STORED:
                                            AREA22

                                      RECORD LENGTH IN WORDS
                                     CONTROL----DATA----TOTAL
                                     -------    ----    -----
                                        4        12       16
                                  2 RESERVED MANUAL POINTER(S)

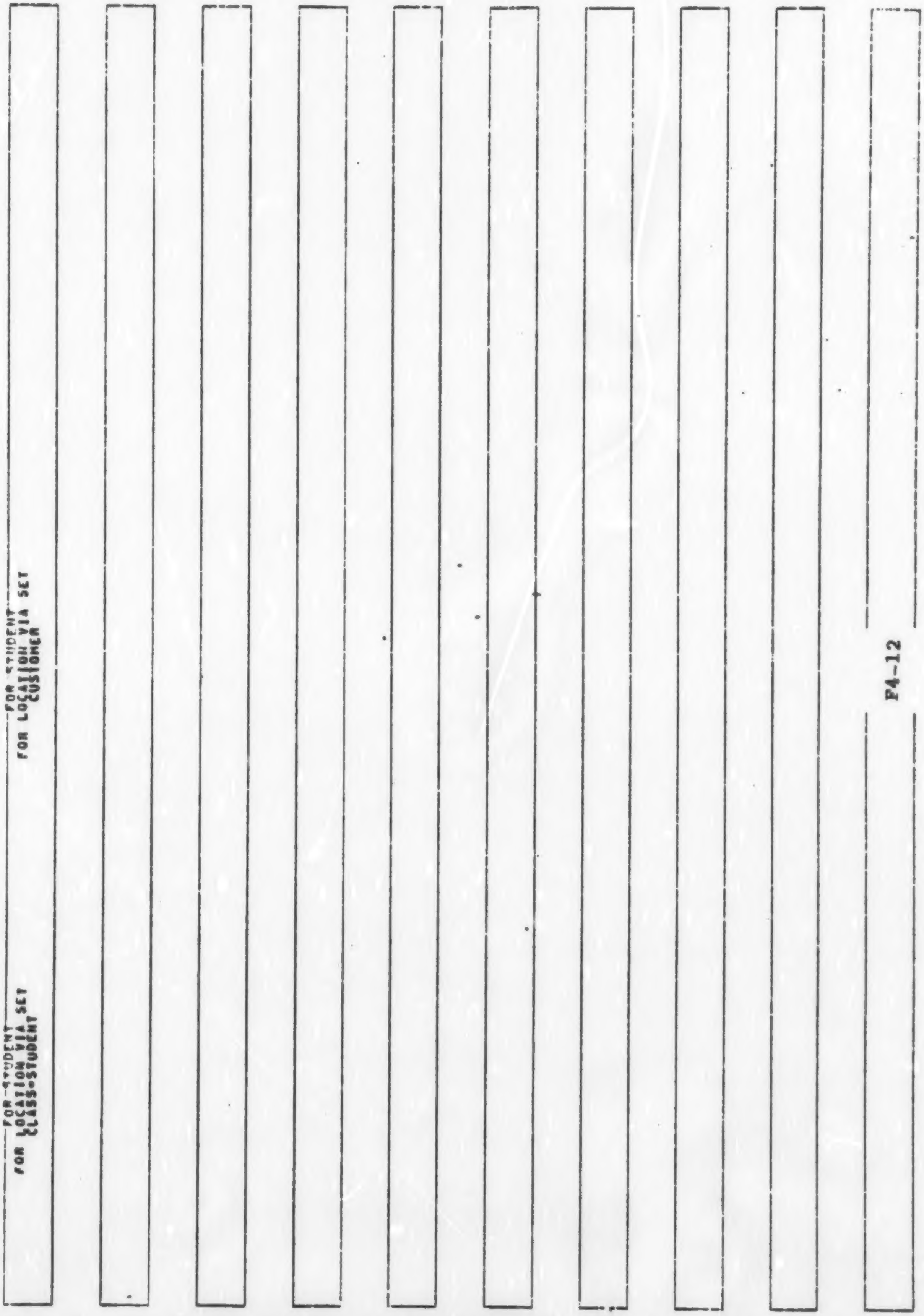
              SET PARTICIPATION            POINTERS         LOCATION CRITERIA AS A MEMBER
              -----------------            --------         -----------------------------
                CLASS-STUDENT                NEXT                   STUDENT-NAME
                  (MANUAL)                                        (ASCENDING KEY)

                  CUSTOMER                   NEXT                   STUDENT-NAME
                  (MANUAL)                                        (ASCENDING KEY)

                  STANDBY                    NEXT                  SET ORDERED LAST
                  (MANUAL)                           LAST MEMBER OF TYPE IS ALWAYS SELECTED

                               PATHS BY WHICH THE RECORD MAY BE LOCATED
                               ----------------------------------------

           PRIME                              ALTERNATE                              ALTERNATE
           -----                              ---------                              ---------
  VIA SET CLASS-STUDENT                   VIA SET CUSTOMER                        VIA SET STANDBY
          AA-NAME                   ESTABLISH A CURRENT OF SET              ESTABLISH A CURRENT OF SET
         CLASS-NO                              CUSTOMER                                STANDBY
FOR CALC LOCATION MODE OF TYPE  THE CURRENT OF SET MAY BE AN OCCURRENCE  THE CURRENT OF SET MAY BE AN OCCURRENCE
           CLASS                         OF OWNER CLASS                          OF OWNER CLASS
                                       OR OF ANY MEMBER TYPE                   OR OF ANY MEMBER TYPE
       STUDENT-NAME                       STUDENT-NAME                   LAST OCCURRENCE OF MEMBER TYPE
      (ASCENDING KEY)                    (ASCENDING KEY)                             STUDENT
                                                                      IS SELECTED FROM THE OCCURRENCE OF
                                                                                     STANDBY
```


FOR STUDENT
FOR LOCATION VIA SET CUSTOMER
FOR-STUDENT
FOR LOCATION VIA SET CLASS-STUDENT

F4-12

```
                                 RECORD INSTRUCTOR

                  AREA(S) IN WHICH THE RECORD MAY BE STORED)
                                   AREA1

                              RECORD LENGTH IN WORDS
                              CONTROL    DATA    TOTAL
                              =======    ====    =====
                                 3         7       10

                               | OWNER POINTER(S)
                               | AUTOMATIC POINTER(S)

        SET PARTICIPATION         POINTERS        LOCATION CRITERIA AS A MEMBER
        =================         ========        =============================
            DEPT-INST               NEXT                    INST-NAME
           (AUTOMATIC)                                   (ASCENDING KEY)

        SET PARTICIPATION         POINTERS        LOCATION CRITERIA AS AN OWNER
        =================         ========        =============================
           INST-CLASS               NEXT      REFER TO PRIME PATH FOR THIS RECORD
                                             (LOCATION MODE OF OWNER SPECIFIED IN
                                                     SOS CLAUSE OF MEMBER
                                                            CLASS
                                               BUT NO ALIAS/USING KEYS SPECIFIED)

                          PATHS BY WHICH THE RECORD MAY BE LOCATED
                          ========================================

          PRIME
          =====
    VIA SET DEPT-INST
  ESTABLISH A CURRENT OF SET
          DEPT-INST
THE CURRENT OF SET MAY BE AN OCCURRENCE
     OF OWNER DEPARTMENT
    OR OF ANY MEMBER TYPE

          INST-NAME
       (ASCENDING KEY)
```

FOR-INSTRUCTOR
FOR LOCATION [illegible]
DEPT-INST

F4-14

```
@SYS$*ALTLIB$.LIST,AO ED-CENTER,SCHEMA
1110-002
```

F4-15

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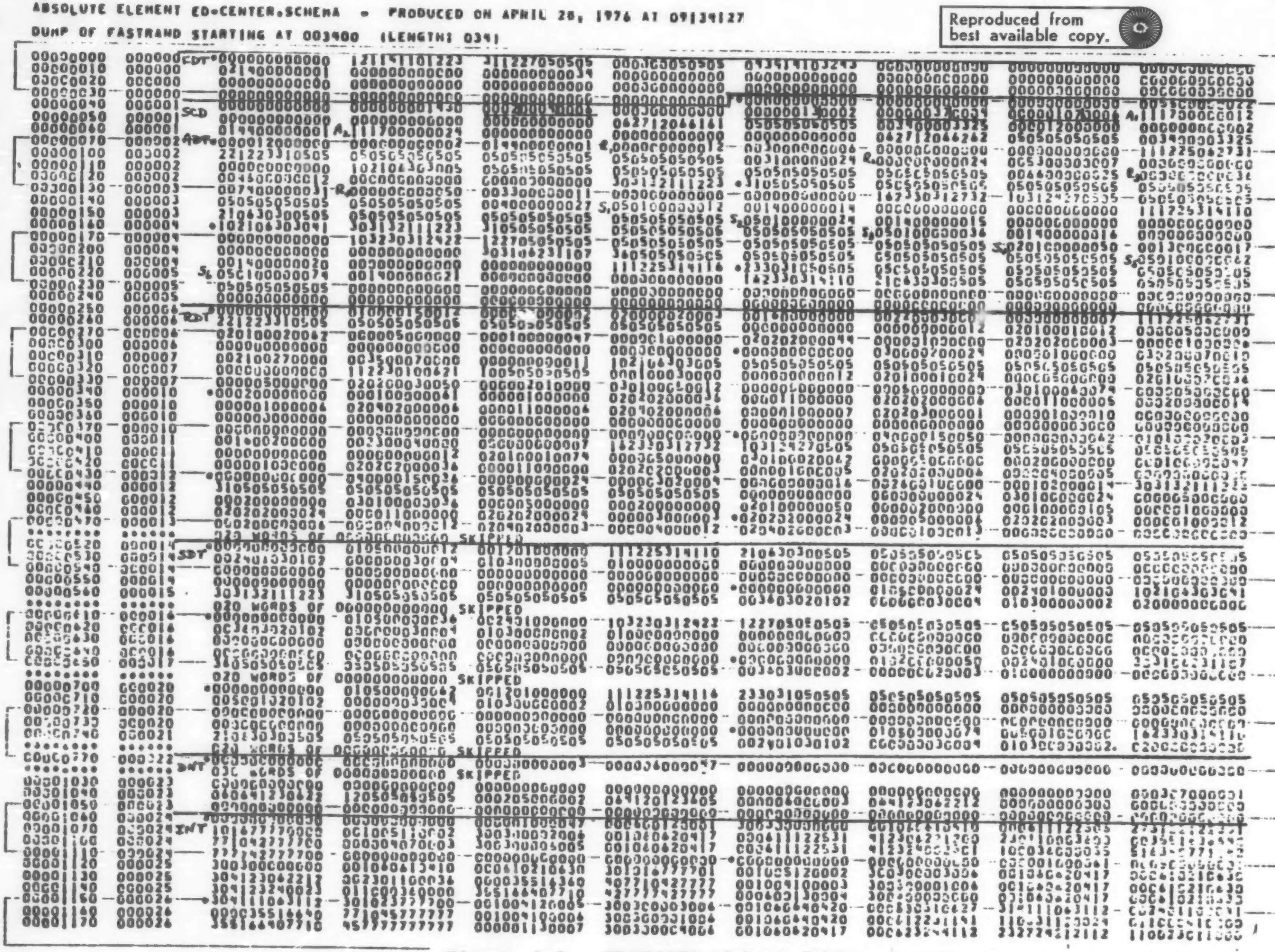


```
ABSOLUTE ELEMENT ED-CENTER.SCHEMA  -  PRODUCED ON APRIL 28, 1976 AT 09:39:27
DUMP OF FASTRAND STARTING AT 003400  (LENGTH: 0341)

00000000  000000 EDT 000000000000  121151101223  311227050505  000000050505  043414103243  000000000000  000000000000  000000000000
00000010  000000     021400000001  000000000000  000000000034  000000000000  000000000000  000000000000  000000000000  000000000000
00000020  000000     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
00000030  000000     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  005300000022
00000040  000001     000000000000  000000001430  000200050001  000000000000  000000130002  000000370035  000001070006  A1 111700000012
00000050  000001 SCD 000000000000  000000000000  000000000000  062712066161  050505050505  003400003325  000012000000  000000000002
00000060  000001     014400000000  A2 111700000024  000000000000  000000000000  000000000000  062712066262  050505050505  003400003325
00000070  000002 ADT 000012000000  000000000002  014400000001  E1 000000000012  003000000006  000000000000  000000000000  111225062731
00000100  000002     221223310505  050505050505  050505050505  050505050505  003100000024  R1 000000000024  005300000007  000000000000
00000110  000002     000000000000  102104363005  050505050505  050505050505  050505050505  050505050505  004600000025  R3 000000000032
00000120  000002     004500000012  000000000000  000000000000  303113211223  310505050505  050505050505  050505050505  050505050505
00000130  000003     007400000003  R2 000000000050  003300000011  000000000000  000000000000  162330312732  103124270505  050505050505
00000140  000003     050505050505  050505050505  004000000027  S1 050100000012  001400000014  000000000000  000000000000  111225314110
00000150  000003     210630300505  050505050505  050505050505  050505050505  S2 050100000024  001400000015  000000000000  000000000000
00000160  000004     102106303041  303113211223  310505050505  050505050506  050505050505  S3 050100000036  001400000016  000000000000
00000170  000004     000000000000  103230312422  122705050505  050505050505  050505050505  050505050505  S4 020100000050  001300000017
00000200  000004     000000000000  000000000000  303106231107  360505050505  050505050505  050505050505  050505050505  S5 050100000062
00000210  000004     001400000020  003000000000  000000000000  111225314116  233031050505  050505050505  050505050505  050505050505
00000220  000005  S6 050100000074  001400000021  000000000000  000000000000  142330314110  210630300505  050505050505  050505050505
00000230  000005     050505050505  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
00000240  000005     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
00000250  000006     000000000000  010000150012  000000000002  020000020003  001600000000  002200030000  000300000007  111225062731
00000260  000006 RDT 221223310505  050505050506  050505050505  050505050505  000000000000  000000000012  020100010012  000005000000
00000270  000006     020100020062  000005000000  000100000047  000001000000  020202000044  000001030000  020202000003  000001030000
00000300  000006     000000000000  000000000000  000000000000  000000000000  000000000000  030000700024  000501000000  030200070010
00000310  000007     002100270000  003500070000  000000000011  102106303005  050505050505  050505050505  050505050505  050505050505
00000320  000007     000000000000  112230100621  100505050505  000100030000  000000000012  020100010024  000005000000  020100070034
00000330  000007     000005000000  020200030050  000002010000  030100060012  000006000000  000500000000  030100060074  000005000000
00000340  000010     000200000000  000100000061  000001000000  020402000036  000011000000  020202000006  000011000005  000200000014
00000350  000010     000001000006  020402000006  000011000006  020402000006  000001000007  020203000001  000001000010  000000000000
00000360  000010     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
00000370  000010     000000000000  000200000000  000000000000  000000000000  000000000000  040000150050  000000000042  010100020003
00000400  000011     001400200000  002300040000  050000000007  162330312732  103124270505  050505050505  050505050505  050505050505
00000410  000011     000000000000  000000000012  020100010074  000365000000  030100020042  000005000000  000200000000  000100000047
00000420  000011     000001030000  020202000036  000011000000  020202000003  000001000005  020202000006  000004050505  000000000030
00000430  000012     000000000000  040000150036  000000000024  000003020004  000000000016  002600100000  000102000014  303113211223
00000440  000012     310505050505  050505050505  050505050505  050505050505  000000000000  060000000024  030100000024  000005000000
00000450  000012     000200000000  030100000036  000005000000  000200000000  020100000050  000002000000  000100000105  000001000000
00000460  000012     020202000024  000011000000  020202000024  000003000003  020202000024  000005000006  020202000003  000001000012
00000470  000013     000200000006  000004000012  020402000003  000004000012  020402000003  000001030013  000000000000  000000000000
********  ******     020 WORDS OF  000000000000  SKIPPED
00000520  000014 SDT 000000000000  010500000012  001701000000  111225314110  210630300505  050505050505  050505050505  050505050505
00000530  000014     002401030102  000000030004  010300000005  010000000000  000000000000  000000000000  000000000005  000000000000
00000540  000014     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
00000550  000014     000000000000  000000000000  000000000000  000000000060  000000000000  010500000024  002401000003  102106303041
00000560  000015     303113211223  310505050505  050505050505  050505050505  003603020102  000000030004  010300000002  020000000000
********  ******     020 WORDS OF  000000000000  SKIPPED
00000610  000016     000000000000  010500000036  002431000000  103230312422  122705050505  050505050505  050505050505  050505050505
00000620  000016     003603020102  000000030004  010300000002  010000000000  000000000003  000005000000  000000000000  000000000000
00000630  000016     000000000000  000000000000  000000000000  000000000000  000000000000  030000000000  000000000000  000000000000
00000640  000016     000000000000  000000000000  000000000000  000000000000  000000000000  013200000050  002401000000  303106231107
00000650  000017     360505050505  050505050505  050505050505  050505050505  003603000002  000000023003  010000000000  000000000000
********  ******     020 WORDS OF  000000000000  SKIPPED
00000700  000020     000000000000  010500000062  001201000000  111225314116  233031050505  050505050505  050505050505  050505050505
00000710  000020     005001320102  000000030004  010300000002  010300000000  000000000000  000000000000  000000000000  000000000000
00000720  000020     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000007
00000730  000020     000000000000  000000000000  000000000000  000000000000  000000000000  010500000074  005601020700  162330314110
00000740  000021     210630300505  050505050505  050505050505  050505050505  002401030102  000000030004  010300000002  020000000000
********  ******     020 WORDS OF  000000000000  SKIPPED
00000770  000022 DNT 000000000000  000000000000  000000000003  000036000047  000000000300  000000000000  000000000000  000000000000
********  ******     030 WORDS OF  000000000000  SKIPPED
00001030  000023     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000300  000307000001
00001040  000023     060641230622  120505050505  000205000002  064120123605  000000600003  064123062212  000600000300  [illegible]
00001050  000023     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  [illegible]
00001060  000024     000000070030  000000000000  000001000047  000060123001  300333030000  001066610510  000611122305  [illegible]
00001070  000024 INT 101677770000  001005110002  300310032006  001060620417  003611122531  412306221200  230110063600  [illegible]
00001100  000024     771042777700  000304070003  300360004005  001060620417  003611122531  [illegible]  [illegible]  [illegible]
00001110  000024     777142777700  000000000000  000000060000  000000000030  000000000000  000600000050  000001600061  [illegible]
00001120  000025     300300000000  001060613410  000610210630  301316777701  001005120002  300300003006  001060620417  [illegible]
00001130  000025     304123062213  002301100036  000035516360  407710427777  001004100003  303300001006  001060620417  [illegible]
00001140  000025     304123240023  011000360000  355166407710  427777427777  000603130304  300600003600  001060620417  [illegible]
00001150  000026     304111063112  301023777700  001004120005  300300003006  001066640420  000830310627  314111063112  [illegible]
00001160  000026     000035516640  771045777777  001004100006  300360331006  001066440420  000612241141  [illegible]  [illegible]
00001170  000026     355166407710  451777777777  000001130007  300330004066  001060620417  000623244112  232724212112  110623011000
```

Figure 4.2: EDCENTER Object Schema

```
00001200  000026    440000717710  507777777777  000000000000  000000000000 •000000000000  000000000000  000001000047  000600120001
00001210  000027    300300000000  001060610410  000616233031  273210312427  101677771000  001005110002  300300002006  001060620417
00001220  000027    000616233031  412306221200  230110004300  003551636040  771047777777  000703040003  300300003005  001060620417
00001230  000027    000611122531  002301100043  000035353577  104777776040  000004130004  300300004006  001060620417  000612222521
00001240  000030   •243612124123  240023011000  430000355166  407710477777  000000000000  000000000000  000000000000  000000000000
********  ******    020 WORDS OF  000000000000 SKIPPED
00001270  000030    000000000000  000000000000  000000000000  000000000000 •000000000000  000000000000  000001000105  000600070001
00001300  000031    300300000000  001060610410  000630313211  122331101677  770023011000  001105140002  300300005006  001060620417
00001310  000031    000630313211  122331412306  221200230110  004100003551  626040771045  777700000000  000705030003  300300002005
00001320  000031    001060620417  000624271400  230110004100  003551626040  771045777751  001105130004  300300004006  001060620417
00001330  000032   •000612232724  212112114107  360023011000  410000355162  604077104577  777700000000  000703040005  300300003005
00001340  000032    001060620417  000624251227  002301100041  000035353577  104577775162  000500040006  300300000000  001060620417
00001350  000032    000610411024  111210237777  000703050007  300300004005  001060640420  000611122523  240024011000  410000353535
00001360  000032    771045777762  000003050010  300300004005  001060640420 •000610213023  240024011000  410000353535  771045777762
********  ******    030 WORDS OF  000000000000 SKIPPED

GEOF
GEOF IGNORED - IN CONTROL MODE

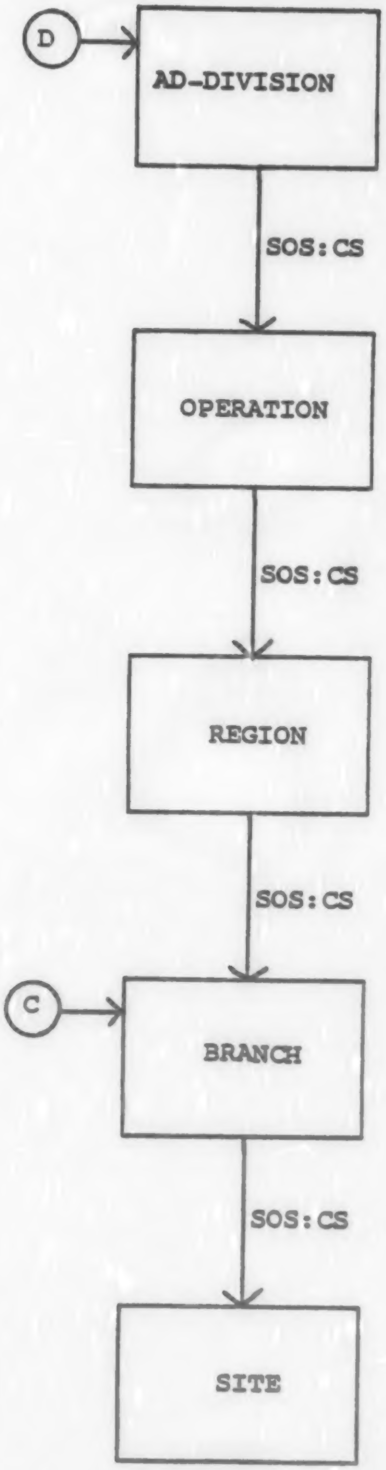
OBRKPT PRINTS
```

F4-17

```
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890**SEQ NO. 01
```

Figure 5: **PROFILE Database**

PROFILE DATABASE


D
AD-DIVISION
SOS:CS
OPERATION
SOS:CS
REGION
SOS:CS
C
BRANCH
SOS:CS
SITE

[illegible] PROP [illegible] SOURCE

F5-2

```
@DMRMT.DDL,IBLR  ,PROFILE.SCHEMA
DDL TRANSLITOR - LEVEL -
PERFORMED ON APRIL 28, 1976 AT 10131154
   1.  00          IDENTIFICATION DIVISION
   2.  00          SCHEMA NAME IS PROFILE
   3.  00          DATA DIVISION
   4.  00          AREA SECTION
   5.  00          AREA LOOKS INCLUDE QUICK-BEFORE-LOOKS
   6.  00          AREA NAME IS BRANCHAREA
   7.  00             AREA CODE IS 1
   8.  00             ALLOCATE 30 PAGES
   9.  00                 5 OVERFLOW AT END
  10.  00                 1 OVERFLOW EVERY 4 DATA
  11.  00             PAGES ARE 1792 WORDS
  12.  00          AREA NAME IS SITEAREA
  13.  00             AREA CODE IS 2
  14.  00             ALLOCATE 100 PAGES
  15.  00                10 OVERFLOW AT END
  16.  00                 1 OVERFLOW EVERY 4 DATA
  17.  00             PAGES ARE 1792 WORDS
  18.  00          RECORD SECTION
  19.  00          RECORD NAME IS AD-DIVISION
  20.  00             RECORD CODE IS 1
  21.  00             LOCATION MODE IS DIRECT AD-KEY AD-NAME
  22.  00                 WITHIN BRANCHAREA
  23.  00             RECORD MODE IS ASCII
  24.  00             05   AD-NAME   PIC X(50)
  25.  00          RECORD NAME IS OPERATION
  26.  00             RECORD CODE IS 2
  27.  00             LOCATION MODE IS VIA AD-DIVISION-OPERATION SET
  28.  00                 WITHIN BRANCHAREA
  29.  00             RECORD MODE  IS ASCII
  30.  00             05  OP-CODE  PIC 9(4)
  31.  00             05  OP-NAME  PIC X(40)
  32.  00          RECORD NAME IS REGION
  33.  00             RECORD CODE IS 3
  34.  00             LOCATION MODE IS VIA OPERATION-REGION SET
  35.  00                 WITHIN BRANCHAREA
  36.  00             RECORD MODE IS ASCII
  37.  00             05  REGION-CODE  PIC 9(4)
  38.  00             05  REGION-NAME  PIC X(40)
  39.  00          RECORD NAME IS BRANCH
  40.  00             RECORD CODE IS 4
  41.  00             LOCATION MODE IS CALC DMSCALC IN CALC-NAME
  42.  00                 USING BRANCH-CODE DUPLICATES ARE NOT ALLOWED
  43.  00                 WITHIN BRANCHAREA
  44.  00             RECORD MODE IS ASCII
  45.  00             05  BRANCH-CODE  PIC 9(4)
  46.  00             05  BRANCH-NAME  PIC X(40)
  47.  00          RECORD NAME IS SITE
  48.  00             RECORD CODE IS 5
  49.  00             LOCATION MODE IS VIA BRANCH-SITE SET
  50.  00                 WITHIN SITEAREA
  51.  00             RECORD MODE IS ASCII
  52.  00             05  SITE-CODE  PIC 9(4)
  53.  00             05  SITE-NAME  PIC X(40)
  54.  00          SET SECTION
  55.  00          SET NAME IS AD-DIVISION-OPERATION
  56.  00             SET CODE IS 1
  57.  00             MODE IS CHAIN
  58.  00             ORDER IS SORTED
  59.  00             OWNER IS AD-DIVISION
  60.  00             MEMBER  IS  OPERATION AUTOMATIC
  61.  00               ASCENDING KEY IS OP-CODE
  62.  00               DUPLICATES  ARE NOT ALLOWED
  63.  00             SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
  64.  00          SET NAME IS OPERATION-REGION
  65.  00             SET CODE IS 2
  66.  00             MODE IS CHAIN
  67.  00             ORDER IS SORTED
  68.  00             OWNER IS OPERATION
  69.  00             MEMBER IS REGION AUTOMATIC
  70.  00               ASCENDING KEY IS REGION-CODE
  71.  00               DUPLICATES ARE NOT ALLOWED
  72.  00             SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
  73.  00          SET NAME IS REGION-BRANCH
  74.  00             SET CODE IS 3
```

Figure 5.1: PROFILE Schema

```
75.  00             MODE IS CHAIN
76.  00             ORDER IS SORTED
77.  00             OWNER IS REGION
78.  00             MEMBER IS BRANCH AUTOMATIC
79.  00               ASCENDING KEY IS BRANCH-CODE
80.  00               DUPLICATES ARE NOT ALLOWED
81.  00             SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
82.  00         SET NAME IS BRANCH-SITE
83.  00             SET CODE IS 9
84.  00             MODE IS CHAIN
85.  00             ORDER IS SORTED
86.  00             OWNER IS BRANCH
87.  00             MEMBER IS SITE AUTOMATIC
88.  00               ASCENDING KEY IS SITE-CODE
89.  00               DUPLICATES ARE NOT ALLOWED
90.  00             SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
```

F5-4

```
                    SCHEMA PROFILE

          GENERATED 10:31:54 APRIL 20, 1976
    AREA CONTROL BITS: 12 MAXIMUM NUMBER OF AREAS: 4000
    AVERAGE RECORD DESCRIPTION TABLE LENGTH IN WORDS: 24
    MAXIMUM RECORD DESCRIPTION TABLE LENGTH IN WORDS: 28
     AVERAGE SET DESCRIPTION TABLE LENGTH IN WORDS: 12
     MAXIMUM SET DESCRIPTION TABLE LENGTH IN WORDS: 12
SCHEMA DESCRIPTION TABLE LENGTH: 1 SEGMENT(S) OF 140 WORDS (EACH)
```

F5-5

```
AREA(S) IN THE SCHEMA

AREA-NAME      RECORDS-WHICH-MAY-BE                    DATABASE-KEY                                  DASD-REQUIREMENTS
               STORED IN THE AREA     AREA  PAGE  MAXIMUM      RECORD  MAXIMUM              POSITIONS OR TRACKS
                                      BITS  BITS  PAGE-NUMBER  BITS    RECORD-NUMBER

BRANCHAREA     AD-DIVISION             12    9     511          15      32767                  1           30
               OPERATION
               REGION
               BRANCH

SITEAREA       SITE                    12    9     511          15      32767                  2          100
```

F5-6

```
                              SET-AREA CROSS REFERENCE TABLE

      SET NAME                 OWNER RECORD           AREA THE SET IS CONTAINED WITHIN    AREA PROTECTION
      --------              AND MEMBER RECORDS         OR AREA(S) SPANNED BY THE SET      ---------------
                            ------------------        --------------------------------

AD-DIVISION-OPERATION          AD-DIVISION                     BRANCHAREA                QUICK-BEFORE-LOOKS
                               OPERATION                       BRANCHAREA                QUICK-BEFORE-LOOKS

  OPERATION-REGION             OPERATION                       BRANCHAREA                QUICK-BEFORE-LOOKS
                               REGION                          BRANCHAREA                QUICK-BEFORE-LOOKS

   REGION-BRANCH               REGION                          BRANCHAREA                QUICK-BEFORE-LOOKS
                               BRANCH                          BRANCHAREA                QUICK-BEFORE-LOOKS

    BRANCH-SITE                BRANCH                          BRANCHAREA                QUICK-BEFORE-LOOKS
                               SITE                            SITEAREA                  QUICK-BEFORE-LOOKS
```

F5-7

```
                              RECORD AD-DIVISION

                    AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                   BRANCHAREA

                              RECORD LENGTH IN WORDS
                              CONTROL    DATA   TOTAL
                              -------    ----   -----
                                 2        13     15
                                ( OWNER POINTERS)

          SET PARTICIPATION          POINTERS         LOCATION CRITERIA AS AN OWNER
          -----------------          --------         -----------------------------
        AD-DIVISION-OPERATION          NEXT             ESTABLISH A CURRENT OF THIS SET
                                                     THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                      OF THE OWNER OR OF ANY MEMBER RECORD.
                                                      CURRENT OF SET SPECIFIED IN SOS CLAUSE
                                                             OF MEMBER OPERATION

                         PATHS BY WHICH THE RECORD MAY BE LOCATED
                         ----------------------------------------

          PRIME
          -----

         AD-NAME
         AD-KEY
FOR DIRECT LOCATION MODE OF TYPE
       AD-DIVISION
```

F5-8

```
                                   RECORD OPERATION

                          AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                       BRANCHAREA

                                RECORD LENGTH IN WORDS
                                CONTROL----DATA----TOTAL
                                -------    ----    -----
                                   3        14      17

                                 ! OWNER-POINTER(S)
                                 ! AUTOMATIC POINTER(S)

          SET PARTICIPATION          POINTERS           LOCATION-CRITERIA-AS-A-MEMBER
          -----------------          --------           -----------------------------
       AD-DIVISION-OPERATION           NEXT                        OP-CODE
            (AUTOMATIC)                                         (ASCENDING KEY)

          SET PARTICIPATION          POINTERS           LOCATION CRITERIA AS AN OWNER
          -----------------          --------           -----------------------------
          OPERATION-REGION             NEXT             ESTABLISH-A-CURRENT-OF-THIS-SET
                                                    THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                     OF THE OWNER OR OF ANY MEMBER RECORD.
                                                     CURRENT OF SET SPECIFIED IN SOS CLAUSE
                                                              OF MEMBER REGION

                          PATHS BY WHICH THE RECORD MAY BE LOCATED
                          ----------------------------------------

          PRIME
          -----
   VIA SET AD-DIVISION-OPERATION

   ESTABLISH A CURRENT OF SET
     AD-DIVISION-OPERATION
THE CURRENT OF SET MAY BE AN OCCURRENCE
     OF OWNER AD-DIVISION
     OR OF ANY MEMBER TYPE

         OP-CODE
      (ASCENDING KEY)
```

F5-9

FOR-OPERATION
FOR LOCATION VIA SET
AD-DIVISION-OPERATION

```
                                                  RECORD REGION

                                AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                                 BRANCHAREA

                                            RECORD LENGTH IN WORDS
                                            CONTROL    DATA    TOTAL
                                            -------    ----    -----
                                               3        11      14

                                            I OWNER POINTER(S)
                                            I AUTOMATIC POINTER(S)

                 SET PARTICIPATION          POINTERS          LOCATION CRITERIA AS A MEMBER
                 -----------------          --------          -----------------------------
                  OPERATION-REGION            NEXT                     REGION-CODE
                    (AUTOMATIC)                                      (ASCENDING KEY)

                 SET PARTICIPATION          POINTERS          LOCATION CRITERIA AS AN OWNER
                 -----------------          --------          -----------------------------
                   REGION-BRANCH              NEXT            ESTABLISH A CURRENT OF THIS SET
                                                          THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                           OF THE OWNER OR OF ANY MEMBER RECORD.
                                                           CURRENT OF SET SPECIFIED IN SOS CLAUSE
                                                                    OF MEMBER-BRANCH

                               PATHS BY WHICH THE RECORD MAY BE LOCATED
                               ----------------------------------------

            PRIME
            -----
    VIA SET OPERATION-REGION

   ESTABLISH A CURRENT OF SET
        OPERATION-REGION
THE CURRENT OF SET MAY BE AN OCCURRENCE
      OF OWNER OPERATION
     OR OF ANY MEMBER TYPE

          REGION-CODE
        (ASCENDING KEY)
```

F5-11

```
FOR-REGION
FOR LOCATION VIA SET
OPERATION-REGION
```

F5-12

```
                                    RECORD BRANCH

                    AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                   BRANCHAREA

                               RECORD LENGTH IN WORDS
                              CONTROL----DATA----TOTAL
                              -------    ----    -----
                                 4        11      15

                                 | OWNER POINTER(S)
                                 | AUTOMATIC POINTER(S)
                                 | CALC POINTER(S)

        SET PARTICIPATION        POINTERS        LOCATION CRITERIA AS A MEMBER
        -----------------        --------        -----------------------------
          REGION-BRANCH            NEXT                   BRANCH-CODE
           (AUTOMATIC)                                  (ASCENDING KEY)

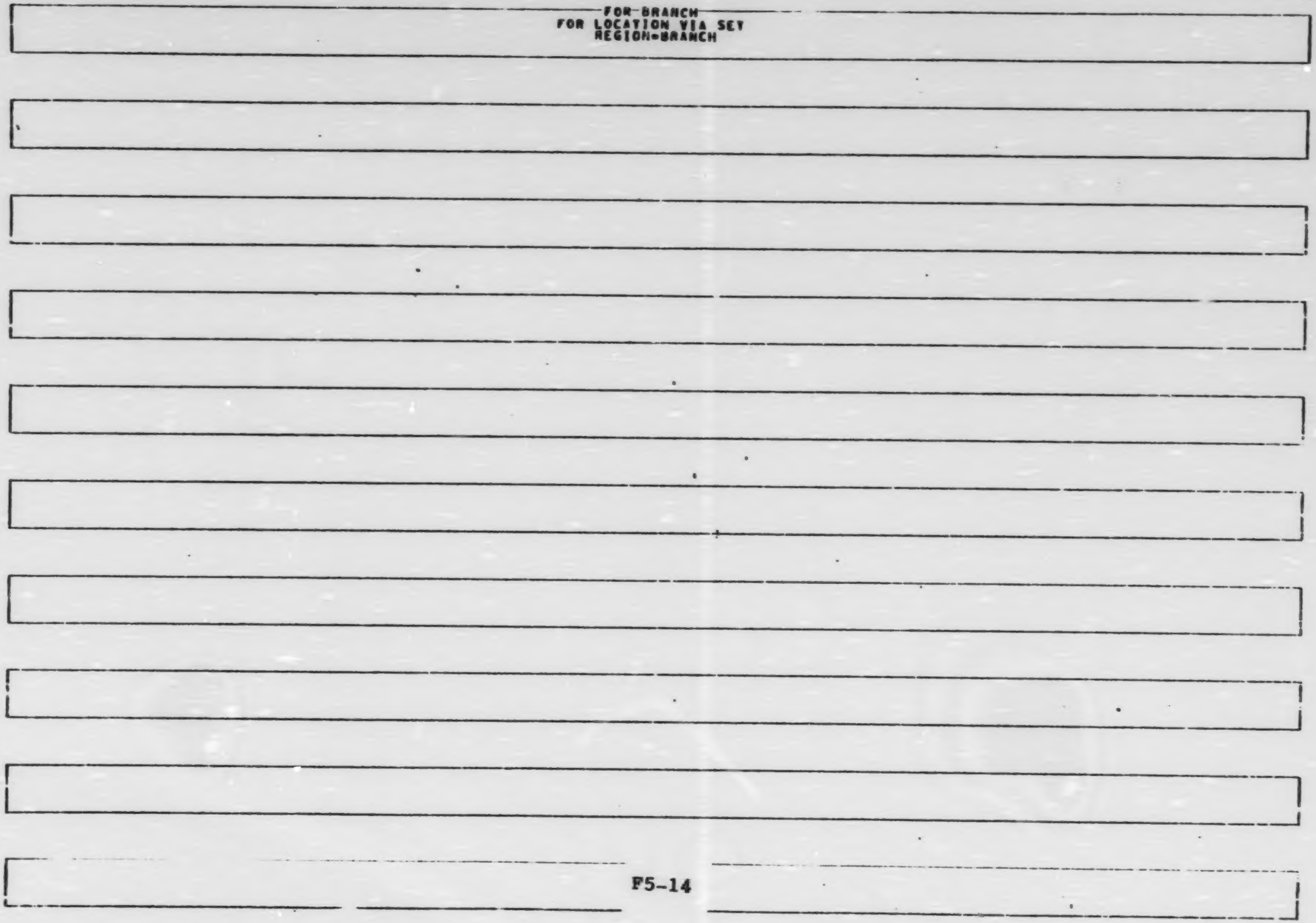
        SET PARTICIPATION        POINTERS        LOCATION CRITERIA AS AN OWNER
        -----------------        --------        -----------------------------
           BRANCH-SITE             NEXT           ESTABLISH A CURRENT OF THIS SET
                                               THE CURRENT OF SET MAY BE AN OCCURRENCE
                                                OF THE OWNER OR OF ANY MEMBER RECORD.
                                                CURRENT OF SET SPECIFIED IN SOS-CLAUSE
                                                            OF MEMBER SITE

                      PATHS BY WHICH THE RECORD MAY BE LOCATED
                      ----------------------------------------

           PRIME                           ALTERNATE
           -----                           ---------
         CALC-NAME                   VIA SET REGION-BRANCH
        BRANCH-CODE
FOR CALC LOCATION MODE OF TYPE       ESTABLISH A CURRENT OF SET
          BRANCH                           REGION-BRANCH
                             THE CURRENT OF SET MAY BE AN OCCURRENCE
                                          OF OWNER REGION
                                      OR OF ANY MEMBER TYPE

                                           BRANCH-CODE
                                         (ASCENDING KEY)
```

F5-13


FOR-BRANCH
FOR LOCATION VIA SET
REGION=BRANCH

F5-14

```
                                RECORD SITE

                  AREA(S) IN WHICH THE RECORD MAY BE STORED:
                                 SITEAREA

                            RECORD LENGTH IN WORDS
                            CONTROL    DATA   TOTAL
                            -------    ----   -----
                               2        11     13
                            1 AUTOMATIC POINTER(S)

        SET PARTICIPATION          POINTERS         LOCATION CRITERIA AS A MEMBER
        -----------------          --------         -----------------------------
           BRANCH-SITE               NEXT                     SITE-CODE
           (AUTOMATIC)                                     (ASCENDING KEY)

                      PATHS BY WHICH THE RECORD MAY BE LOCATED
                      ----------------------------------------

            PRIME
            -----
      VIA SET BRANCH-SITE

     ESTABLISH A CURRENT OF SET
            BRANCH-SITE
 THE CURRENT OF SET MAY BE AN OCCURRENCE
          OF OWNER BRANCH
        OR OF ANY MEMBER TYPE

            SITE-CODE
         (ASCENDING KEY)
            FOR SITE
     FOR LOCATION-VIA-SET
           BRANCH-SITE
```

F5-15

```
QSYS$*ALTLIBS.LIST,AO  PROFILE,SCHEMA
1110-002
```

TV-4-61

Reproduced from best available copy.

```
ABSOLUTE ELEMENT PROFILE.SCHEMA  -  PRODUCED ON APRIL 28, 1976 AT 10:31:54
DUMP OF FASTRAND STARTING AT 006331  (LENGTH: 026)

00000000  000000 FDT 000000000000  252724131621  120505050505  000000050505  043414112032  000000000000  000000000000  000000000000
00000010  000000     021400000001  000000000000  000000000026  000000000000  000000000006  003000000000  000000000000  000000000000
00000020  000000     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
00000030  000000     000000000000  000000000000  000000000000  000000000000 •000000000000  000000000000  000000000000  005700000017
00000040  000001 SCD 000000000000  000000001430  000200050004  000000000000  000000130002  000000370005  000001210004 A1 111700000001
00000050  000001     000000000000  000000000000  000000000000  [illegible]231015  062712060505  003400003325  000003600004  000001000005
00000060  000001 ADT 014401000001 A2 111700000002  000000000000  000000000000  000000000000  301531120627  120505050505  003400003325
00000070  000002    •000144000011  000001000012  014401000001 A1 000100000001  002400000006  000000000000  000000000000  061141111633
00000100  000002     163016242305  050505050505  050505050505  050505050505  002100000021 C1 000100000002  003100000007  000000000000
00000110  000002     000000000000  242512270631  162423050505  050505050505  050505050505  050505050505  003100000022 C1 000100000003
00000120  000002     003100000010  000000000000  000000000000  [illegible]162423 •050505050505  050505050505  050505050505  050505050505
00000130  000003     003100000023 C1 000100000004  003400000011  000000000000  000000000000  072706231015  050505050505  050505050505
00000140  000003     050505050505  050505050505  003100000024 C1 000100000005  002700000012  000000000000  000000000000  301631120505
00000150  000003     050505050505  050505050505  050505050505  050505050505  003000000025 S1 050100000001  001400000013  000300000000
00000160  000004    •000000000000  061141111633  163016242341  242512270631  162423050505  050505050505 S2 050100000002  001400000014
00000170  000004     000000000000  000000000000  242512270631  162423412712  141624230505  050505050505  050505050505 S3 050100000003
00000200  000004     001400000015  000000000000  000000000000  271214162423  410727062310  150505050505  050505050505  050505050505
00000210  000004  S4 050100000004  001400000016  000000000000  000000000000 •072706231015  413016311205  050505050505  050505050505
00000220  000005     050505050505  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
********  ******     020 WORDS OF 000000000000 SKIPPED
00000250  000006 RDT 000000000000  010000150001  000002000001  010000010002  001600000000  002000020000  000000000015  061141111633
00000260  000006     163016242305  050505050505  050505050505  050505050505  000000000000  000000000001  020100010001  000005000000
00000270  000006     000100000113  000001000000  070502000062  000001000000  000000000000  000000000000  000000000000  000000000000
00000300  000006     000000000000  000000000000  000000000000  000000000000 •000000000000  040000150002  000000000001  010100020003
00000310  000007     001600200000  002300030000  000000000016  242512270631  162423050505  050505050505  050505050505  050505050505
00000320  000007     000000000000  000000000001  020100010002  000005000000  030100020001  000005000000  000200030000  000100000120
00000330  000007     000001000000  070503000004  000011500000  070502000061  000001000001  000000000000  000000000000  000000000000
00000340  000010    •000000000000  040000150003  000000000002  010100020003  001600200000  002300030000  000000000013  271214162423
00000350  000010     050505050505  050505050505  050505050505  050505050505  000000000000  000000000001  020100010003  000005000000
00000360  000010     030100020002  000005000000  000205000000  000100000102  000001000000  070503000004  000011000000  070502000050
00000370  000010     000001000001  000000000000  000000000000  000000000000 •000000000000  030300020004  000003000000  010100030004
00000400  000011     002100230000  002400030000  000000000013  072706231015  050505050505  050505050505  050505050505  050505050505
00000410  000011     000000000000  112230100621  100505050505  000100020000  000000000001  020100010004  000005000000  030100020003
00000420  000011     000005000000  000700000000  000100000102  000001000000  070503000004  000011000000  070502000050  000001000001
00000430  000012    •000000000000  040000150005  000000000004  000100010002  000000140000  032100030000  000000000013  301631120505
00000440  000012     050505050505  050505050505  050505050505  050505050505  000000000000  000000000002  030100010004  000005000003
00000450  000012     000200000000  000100000102  000001000000  070503000004  000001000000  070502000050  000001000001  000000000000
00000460  000012     000000000000  000000000000  000000000000  000000000000 •000000000000  010500000001  000101000000  061141111633
00000470  000013 SDT 163016242341  242512270631  162423050505  050505050505  000201030107  000000030004  010300000002  010000000000
********  ******     020 WORDS OF 000000000000 SKIPPED
00000520  000014    •000000000000  010500000002  000201000000  242512270631  162423412712  141624230505  050505050505  050505050505
00000530  000014     000301030102  000000030004  010300000002  010000000000  000000000000  000000000000  000000000000  000000000000
00000540  000014     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
00000550  000014     000000000000  000000000000  000000000000  000000000000 •000000000000  010500000003  000301000000  271214162423
00000560  000015     410727062310  150505050505  050505050505  050505050505  000401030102  000000030004  010300000002  010000000000
********  ******     020 WORDS OF 000000000000 SKIPPED
00000610  000016    •000000000000  010500000004  000401000000  072706231015  413016311205  050505050505  050505050505  050505050505
00000620  000016     000501030102  000000030004  010300000002  010000000000  000000000000  000000000000  000000000000  000000000000
00000630  000016     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
00000640  000016     000000000000  000000000000  000000000000  000000000000 •000000000000  000000000000  000000000003  000002000047
00000650  000017 DWT 000000000000  000001000054  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
********  ******     030 WORDS OF 000000000000 SKIPPED
00000710  000020     000000000000  000000000000  000000000000  000204000001  061141201236  000007000002  061141230622  120505050505
00000720  000020     000011000003  100621104123  062212050505  000000000000  000000000000  000000000000  000000000000  000000000000
00000730  000020     000000000000  000000000000  000000000000  000000000000 •000000000000  000000000000  000001000113  000000010001
00000740  000021 IWT 300300000000  001040610410  000406111411  162316301624  231016777700  000005070002  300300006005  001040650414
00000750  000021     000406114123  062212002001  160031000035  516560407710  357777000000  000000000000  000000000000  000000000000
00000760  000021     000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
00000770  000022    •000000000000  000000000000  000001000120  000600110001  300300000000  001040610410  000624251227  063116242310
00001000  000022     167777000035  001204073002  300300006005  001040650414  000624254110  241112002001  100031000071  514457771035
00001010  000022     777777000000  000005370003  300300006005  001040650414  000624254123  062212002001  100031000035  514471407710
00001020  000022     357777000000  000000000000  000000000000  000000000000 •000000000000  000000000000  000001000102  000500060001
00001030  000023     300300000000  001040610410  000627121416  242310167777  001004130002  300300004006  001040650414  000627121416
00001040  000023     242341102411  120020011000  350000715164  407710417777  000005130003  300300004006  001040650414  000627121416
00001050  000023     242341230622  120020011000  350000355164  604077104177  770000000000  000000000000  000000000000  000000000000
00001060  000024    •000000000000  000000000000  000001000102  000500060001  300300000000  001040610410  000607270623  101510167777
00001070  000024     001000410002  330306005006  001040650414  000607270623  101541102411  120020011000  350000715164  407710417777
00001100  000024     000005130003  300300004006  001040650414  000607270623  101541230622  120020011000  350000355164  604077104177
00001110  000024     770000000000  000000000000  000000000000  000000000000 •000000000000  300000000000  000001000102  000500040001
00001120  000025     300300000000  001040610410  000630163112  101677770622  001004110002  300300002006  001040650414  000630163112
00001130  000025     411024111230  200110003300  007151644077  103777774177  000005110003  300300002006  001040650414  000630163112
00001140  000026     412306221200  200110003300  003551446040  771037777777  061020620505  040001073141  000000000000  000000000000
```

Figure 5.2: PROFILE Object Schema

```
@ECF
@EOF IGNORED - IN CONTROL MODE
@BRKPT PRINTS
```

TV-4-63

```
12345678901234567890123456789012   4789012345678901234567890123456789012.  678901234567890123456789012345678901234567890**SEQ NO. 03
```

Figure 6: EDCENTER Load Program
and ERRDUMP
Core Map Table
Dynamic Table Area

```
@ELT,L EDCENTER.EDCENTER
ELT077 RLIB70 03/26-11191199-(1,)
000001      000      IDENTIFICATION DIVISION
000002      000      SCHEMA NAME IS ED-CENTER
000003      000      DATA DIVISION
000004      000      AREA SECTION
000005      000      AREA LOOKS INCLUDE QUICK-BEFORE-LOOKS
000006      000          BEFORE-LOOKS AFTER-LOOKS
000007      000      AREA NAME IS AREA11
000008      000             AREA CODE IS 1001
000009      000             ALLOCATE IN PAGES 2 OVERFLOW PAGES
000010      000             PAGES ARE 1792 WORDS
000011      000      AREA NAME IS AREA22
000012      000             AREA CODE IS 1002
000013      000             ALLOCATE IN PAGES 2 OVERFLOW PAGES
000014      000             PAGES ARE 1792 WORDS
000015      000      RECORD SECTION
000016      000      RECORD NAME IS DEPARTMENT
000017      000             RECORD CODE IS 1001
000018      000             LOCATION MODE IS DIRECT A-KEY A-NAME
000019      000             WITHIN AREA11
000020      000             02  DEPT-NAME   PIC X(36)
000021      000             02  DEPT-NO     PIC X(3)
000022      000      RECORD NAME IS CLASS
000023      000             RECORD CODE IS 1002
000024      000             LOCATION MODE IS CALC DMSCALC
000025      000              IN AA-NAME USING CLASS-NO
000026      000              DUPLICATES ARE NOT ALLOWED
000027      000             WITHIN AREA11
000028      000             02  CLASS-NAME PIC X(30)
000029      000             02  CLASS-NO    PIC X(6)
000030      000             02. CLASS-DATES
000031      000              04  START-DATE     PIC X(6)
000032      000              04  END-DATE       PIC X(6)
000033      000             02  NO-ENROLLED        PIC 9
000034      000      RECORD NAME IS INSTRUCTOR
000035      000             RECORD CODE IS 1004
000036      000             LOCATION MODE IS VIA DEPT-INST SET
000037      000             WITHIN AREA11
000038      000             02  INST-NAME          PIC X(30)
000039      000             02  DEPT               PIC XXX
000040      000             02  EMPLOYEE-NO        PIC X(6)
000041      000      RECORD NAME IS STUDENT
000042      000             RECORD CODE IS 1003
000043      000             LOCATION MODE IS VIA CLASS-STUDENT SET
000044      000             WITHIN AREA22
000045      000             RESERVE 2 POINTERS
000046      000             02  STUDENT-NAME   PIC X(20)
000047      000             02  ORG            PIC X(20)
000048      000             02  ENROLLED-BY    PIC X(20)
000049      000             02  OPER           PIC XXX
000050      000             02. C-CODE
000051      000              04  DEPNO         PIC XXX
000052      000              04  CLSNO         PIC XXX
000053      000      SET SECTION
000054      000      SET NAME IS DEPT-CLASS
000055      000             SET CODE IS 1001
000056      000             MODE IS CHAIN
000057      000             ORDER IS SORTED
000058      000             OWNER IS DEPARTMENT
000059      000             MEMBER IS CLASS AUTOMATIC
000060      000             ASCENDING KEY IS START-DATE
000061      000             DUPLICATES ARE NOT ALLOWED
000062      000             SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
000063      000      SET NAME IS CLASS-STUDENT
000064      000             SET CODE IS 1002
000065      000             MODE IS CHAIN
000066      000             ORDER IS SORTED
000067      000             OWNER IS CLASS
000068      000             MEMBER IS STUDENT MANUAL
000069      000             ASCENDING KEY IS STUDENT-NAME
000070      000             DUPLICATES ARE LAST
000071      000             SET OCCURRENCE SELECTION IS THRU LOCATION MODE OF OWNER
000072      000      SET NAME IS CUSTOMER
000073      000             SET CODE IS 1003
000074      000             MODE IS CHAIN
000075      000             ORDER IS SORTED
000076      000             OWNER IS CLASS
000077      000             MEMBER IS STUDENT MANUAL
```

```
000078      000                ASCENDING KEY IS STUDENT-NAME
000079      000                DUPLICATES ARE LAST
000080      000                SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
000081      000          SET NAME IS STANDRT
000082      000                SET CODE IS 1009
000083      000                MODE IS CHAIN
000084      000                ORDER IS LAST
000085      000                OWNER IS CLASS
000086      000                MEMBER IS STUDENT MANUAL
000087      000                SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
000088      000          SET NAME IS DEPT-INST
000089      000                SET CODE IS 1005
000090      000                MODE IS CHAIN
000091      000                ORDER IS SORTED
000092      000                OWNER IS DEPARTMENT
000093      000                MEMBER IS INSTRUCTOR AUTOMATIC
000094      000                ASCENDING KEY IS INST-NAME
000095      000                DUPLICATES ARE LAST
000096      000              SET OCCURRENCE SELECTION IS THRU CURRENT OF SET
000097      000          SET NAME IS INST-CLASS
000098      000                SET CODE IS 1006
000099      000                MODE IS CHAIN
000100      000                ORDER IS SORTED
000101      000                OWNER IS INSTRUCTOR
000102      000                MEMBER IS CLASS AUTOMATIC
000103      000                ASCENDING KEY IS CLASS-NAME
000104      000                DUPLICATES ARE NOT ALLOWED
000105      000                SET OCCURRENCE SELECTION IS THRU LOCATION MODE OF OWNER

END ELT.

@END
@END IGNORED - IN CONTROL MODE
```

```
@ELT,L EDCENTER.LOAD
ELT077 RLIB70 03/26-11:42:40-(51,)
000001     047   @ASG,T QUICK-LOOK1.
000002     047   @DELETE,C AREA11.
000003     047   @DELETE,C AREA22.
000004     047   @ASG,UP AREA11.
000005     047   @ASG,UP AREA22.
000006     050   @DMSL6.DMLP,IN      ,DMLOUT
000007     047              IDENTIFICATION DIVISION.
000008     047              PROGRAM-ID. VFL.
000009     047              ENVIRONMENT DIVISION.
000010     047              CONFIGURATION SECTION.
000011     047              SOURCE-COMPUTER. UNIVAC-1106.
000012     047              OBJECT-COMPUTER. UNIVAC-1106.
000013     047              INPUT-OUTPUT SECTION.
000014     047              FILE-CONTROL.
000015     047                  SELECT CARD-IN ASSIGN TO CARD-READER.
000016     047              DATA DIVISION.
000017     047              FILE SECTION.
000018     047              FD  CARD-IN
000019     047                  LABEL RECORDS ARE OMITTED
000020     047                  DATA RECORD IS IN-CARD.
000021     047              01  IN-CARD.
000022     047                  02  TYP         PIC  9.
000023     047                  02  INFO        PIC  X(79).
000024     047              SCHEMA SECTION.
000025     047              INVOKE SCHEMA ED-CENTER
000026     047                  COPYING ALL
000027     047                  RECORD DELIVERY-AREA IS RDA1
000028     047                  LENGTH IS 20 WORDS
000029     047                  ROLLBACK IS RB-PAR.
000030     047              WORKING-STORAGE SECTION.
000031     047              77  NUM PIC 9(10) USAGE IS COMP.
000032     047              77  AA-NAME USAGE IS AREA-NAME VALUE IS 'AREA11'.
000033     047              77  A-NAME USAGE IS AREA-NAME VALUE IS 'AREA11'.
000034     047              01  A-KEY USAGE IS AREA-KEY.
000035     047              01  ERROR-CODES.
000036     047                  02  NUM-CODES PIC 9(10) USAGE IS COMP.
000037     047                  02  CODES PIC X(6) OCCURS 10 TIMES.
000038     047              PROCEDURE DIVISION.
000039     047              START.
000040     047                  OPEN INPUT CARD-IN.
000041     047                  IMPART.
000042     048                  PERFORM ERROR-PAR THRU EXIT-PAR.
000043     048                  ENTER FDLIST SUBROUTINE REFERENCING ERROR-CODES.
000044     047                  MOVE 7 TO NUM.
000045     047                  ENTER ERROR SUBROUTINE REFERENCING NUM, ERROR-CODES, 'ALL'
000046     047                  OPEN ALL USAGE-MODE IS INITIAL LOAD.
000047     047                  PERFORM ERROR-PAR THRU EXIT-PAR.
000048     047              BEGIN.
000049     047                  READ CARD-IN AT END GO TO END-IT.
000050     047                  IF TYP = 1 GO TO S-DEPARTMENT.
000051     047                  IF TYP = 2 GO TO S-INSTRUCTOR.
000052     047                  IF TYP = 3 GO TO S-CLASS.
000053     047                  DISPLAY 'INPUT ERROR TYPE INFO' UPON PRINTER.
000054     047              S-DEPARTMENT.
000055     047                  MOVE INFO TO DEPARTMENT.
000056     047                  MOVE 1 TO PAGE-NUM OF A-KEY.
000057     047                  MOVE 1 TO RECORD-NUM OF A-KEY.
000058     047                  MOVE DEPARTMENT TO RDA1.
000059     047                  MONITOR RDA1.
000060     047                  STORE DEPARTMENT.
000061     047                  MONITOR RDA1.
000062     047                  PERFORM ERROR-PAR THRU EXIT-PAR.
000063     047                  GO TO BEGIN.
000064     047              S-INSTRUCTOR.
000065     047                  MOVE INFO TO INSTRUCTOR.
000066     047                  MOVE INSTRUCTOR TO RDA1.
000067     047                  MONITOR RDA1.
000068     047                  STORE INSTRUCTOR.
000069     047                  MONITOR RDA1.
000070     047                  PERFORM ERROR-PAR THRU EXIT-PAR.
000071     047                  GO TO BEGIN.
000072     047              S-CLASS.
000073     047                  MOVE INFO TO CLASS.
000074     047                  MOVE CLASS TO RDA1.
000075     047                  MONITOR RDA1.
000076     047                  STORE CLASS.
000077     047                  MONITOR RDA1.
```

```
000078      047              PERFORM ERROR-PAR THRU EXIT-PAR.
000079      047              GO TO BEGIN.
000080      047          ERROR-PAR.
000081      047              IF ERROR-STATUS = '000000' GO TO EXIT-PAR.
000082      047              DISPLAY ERROR-STATUS UPON PRINTER.
000083      047              GO TO FINI.
000084      047          EXIT-PAR.
000085      047              EXIT.
000086      047          RB-PAR.
000087      047              DISPLAY 'ROLLBACK ERROR' ERROR-STATUS UPON PRINTER.
000088      047              STOP RUN.
000089      047          FINI.
000090      047              CLOSE ALL.
000091      047              PERFORM ERROR-PAR THRU EXIT-PAR.
000092      047              DEPART.
000093      047              PERFORM ERROR-PAR THRU EXIT-PAR.
000094      047              CLOSE CARD-IN.
000095      047              STOP RUN.
000096      047          END-IT.
000097      047              DISPLAY  'DATABASE PRINT' UPON PRINTER.
000098      047              FETCH FIRST DEPARTMENT WITHIN AREA11 AREA.
000099      047              PERFORM ERROR-PAR THRU EXIT-PAR.
000100      047              DISPLAY RDA1 UPON PRINTER.
000101      047          F-INSTRUCTOR.
000102      047              IF DEPT-INST SET EMPTY GO TO F-DEPARTMENT.
000103      047              FETCH NEXT INSTRUCTOR WITHIN DEPT-INST SET
000104      047                  AT END GO TO F-DEPARTMENT.
000105      047              PERFORM ERROR-PAR THRU EXIT-PAR.
000106      047              DISPLAY RDA1 UPON PRINTER.
000107      047          F-CLASS.
000108      047              IF INST-CLASS SET EMPTY GO TO F-INSTRUCTOR.
000109      047              FETCH NEXT CLASS WITHIN INST-CLASS SET
000110      047                AT END GO TO F-INSTRUCTOR.
000111      047              PERFORM ERROR-PAR THRU EXIT-PAR.
000112      047              DISPLAY RDA1 UPON PRINTER.
000113      047              GO TO F-CLASS.
000114      047          F-DEPARTMENT.
000115      047              FETCH NEXT DEPARTMENT WITHIN AREA11 AREA AT END GO TO FINI.
000116      047              PERFORM ERROR-PAR THRU EXIT-PAR.
000117      047              DISPLAY RDA1 UPON PRINTER.
000118      047              GO TO F-INSTRUCTOR.
000119      047     @LIBS.COB,ERA  DMLOUT
000120      047     @PREP TPF$.
000121      050     @MAP,IN    ,.TEST
000122      047       IN TPF$.
000123      047       IN DMSL6.DMR
000124      047       IN DMSL6.CLSEGS
000125      047       IN DMSL6.LINKER
000126      047       IN TPF$.ASWORKVFL
000127      047      LIB DMSL6.
000128      047     @XQT    .TEST
000129      047     1COMPUTER SCIENCE                      601
000130      047     2MAC FADDEN MARY                 601507123
000131      047     3ELEMENTARY DATA PROCESSING      6010010901751231750
000132      047     2ROBERTS, PRUDENCE               601195236
000133      047     3COMPUTER PROGRAMMING FUND.      6010020902751231750
000134      047     2LANDERS JAMES                   601598765
000135      047     3DATABASE DESIGN                 6010030801750831750
000136      047     2THOMPSON, FRANCIS               601345678
000137      047     3DATA MANAGEMENT SYSTEMS         6010040815760915750
000138      047     @END

END ELT.

@END
@END IGNORED - IN CONTROL MODE

@ADD,P TOCENTER.LOAD

@ASG,T QUICK-LOOK1.
FACILITY WARNING  100000000000

@DELETE,C AREA11.
FURPUR 0026-03/28-11:43
```

```
@FREE,D      RS*AREA11
CSF$ STATUS 400000000000

@DELETE,C AREA22.
@FREE,D      RS*AREA22
CSF$ STATUS 400000000000

@ASG,UP AREA11.
FACILITY WARNING  100000000000

@ASG,UP AREA22.
FACILITY WARNING  100000000000
```

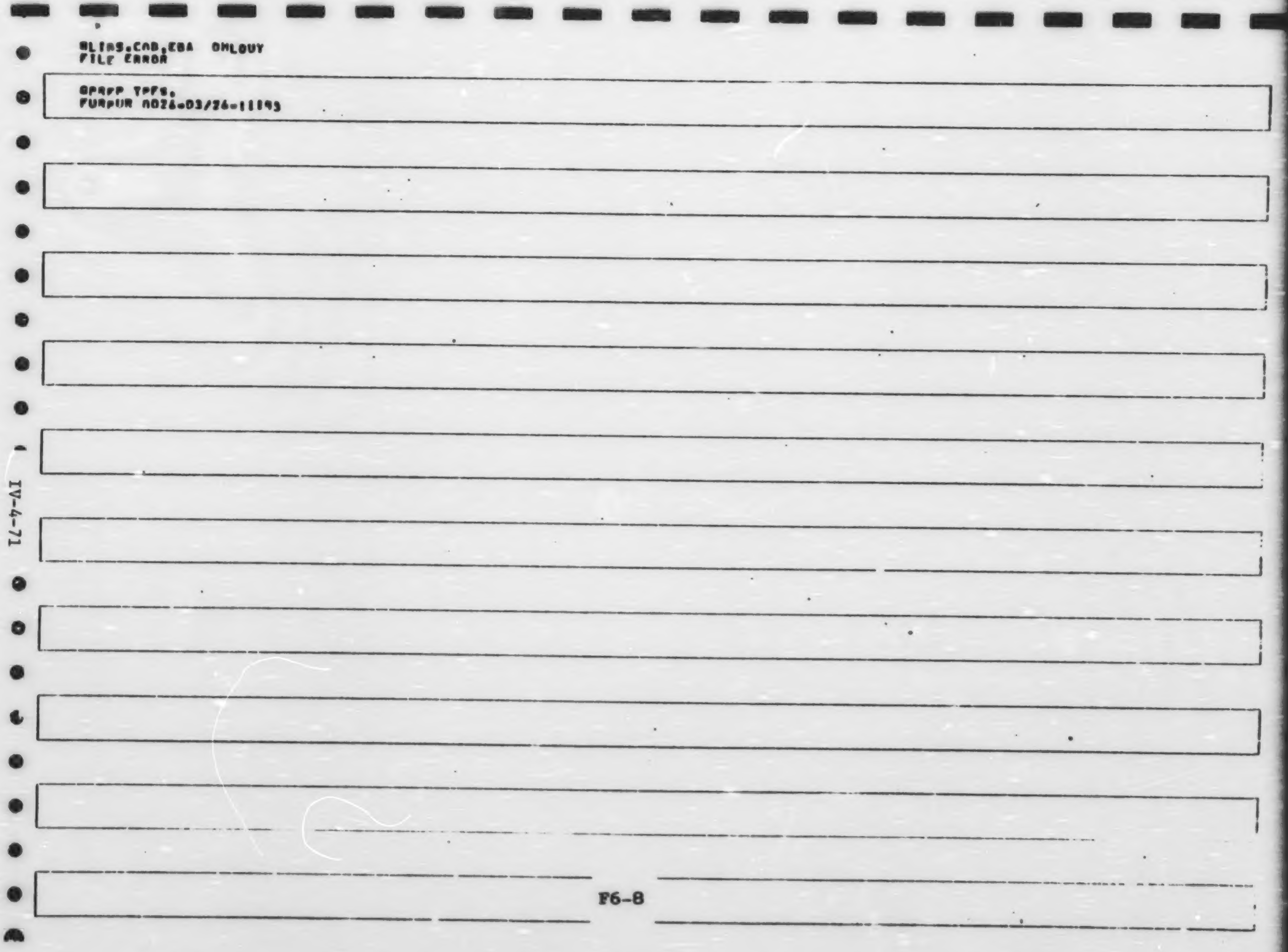
```
CDMSL6,DMLP,IR     ,DMLOUT
CYCLE 000  DML PREPROCESSOR LEVEL 6.01     26 MAR 76 AT 11:43:26

COMPILE TIME IS      .58 SECONDS
```

F6-6

```
@COR,B          DMLOUT,.VFL
COBM04R-03/26-11143-10,1

END  COR  ERRORS:       0
COMPILE TIME IS  0001.18 SECONDS
```



```
ALIAS.CAB,EBA  DHLOUY
FILE ERROR
GRAPP TPF$.
FURPUR 0026-03/26-11193
```

F6-8

```
@MAP,IN   ,.TEST
MAP>AR1 RL71-3 03/26/76 11193134
FILE  DMSL6          DOES NOT CONTAIN AN ENTRY POINT TABLE
C89330      ENTRY POINT      C89327          ALREADY DEFINED
C89330      ENTRY POINT      C89335          ALREADY DEFINED
END MAP

@XQT   .TEST
S=DEPARTMENT
           COMPUTER SCIENCE           RDA1      601
S=DEPARTMENT
           COMPUTER SCIENCE           RDA1      601
S=INSTRUCTOR
           MAC FADDEN MARY            RDA1    601507123
S=INSTRUCTOR
           MAC FADDEN MARY            RDA1    601507123
S=CLASS
           ELEMENTARY DATA PROCESSING RDA1    601001090175173125O

ERRDMP      013123          091693           11193159        03/26/76         1110 TIME-SHARING  EXEC

X REG
000000    005133190573   000000013320   000000145153   146005021323   000009145741   000000145211   000000091611   777777057701
000010    000000145153   148745021346   145745021900   000000057409   000000000000   000000000005   000001031227   175100100002
A REG
000014    000000000000   000000000005   000001031227   175100100002   000000031222   000000000011   175100200001   175100200001
000024    000000000001   000000000002   000000004562   777777777776   000000000000   000000000000   000000001111   000000000000
000034    000000010010   060359000090
R REG
000100    000000000000   000000000001   000000000005   000000090219   000000000000   000000000000   000000000000   000000000000
000110    777777777776   000000000764   000000271106   000000000061   000000001200   420044040002   000000000000   000000000001
013020    656200000000

BUFDMP      013123          136379           11193159        03/26/76         1110 TIME-SHARING  EXEC

X REG
000000    005133190573   000000013320   000000145153   146005021323   000009145741   000000091640   000000091611   777777057701
000010    000000145153   145745021346   145745021900   000000057409   000000000000   000000013122   000001031227   175100100002
A REG
000014    000000000000   000000013122   000001031227   175100100002   000000031222   000000000011   175100200001   175100200001
000024    000000000001   000000000002   000000004562   777777777776   000000000000   000000000000   000000001111   000000000001
000034    000000010010   060359000090
R REG
000100    000000000000   000000000001   000000000005   000000090214   000000000000   000000000000   000000000000   000000000000
000110    777777777776   000000000764   000000271106   000000000061   000000001200   420095090002   000000000000   000000000001
DMS 100 DUMP   - AR1

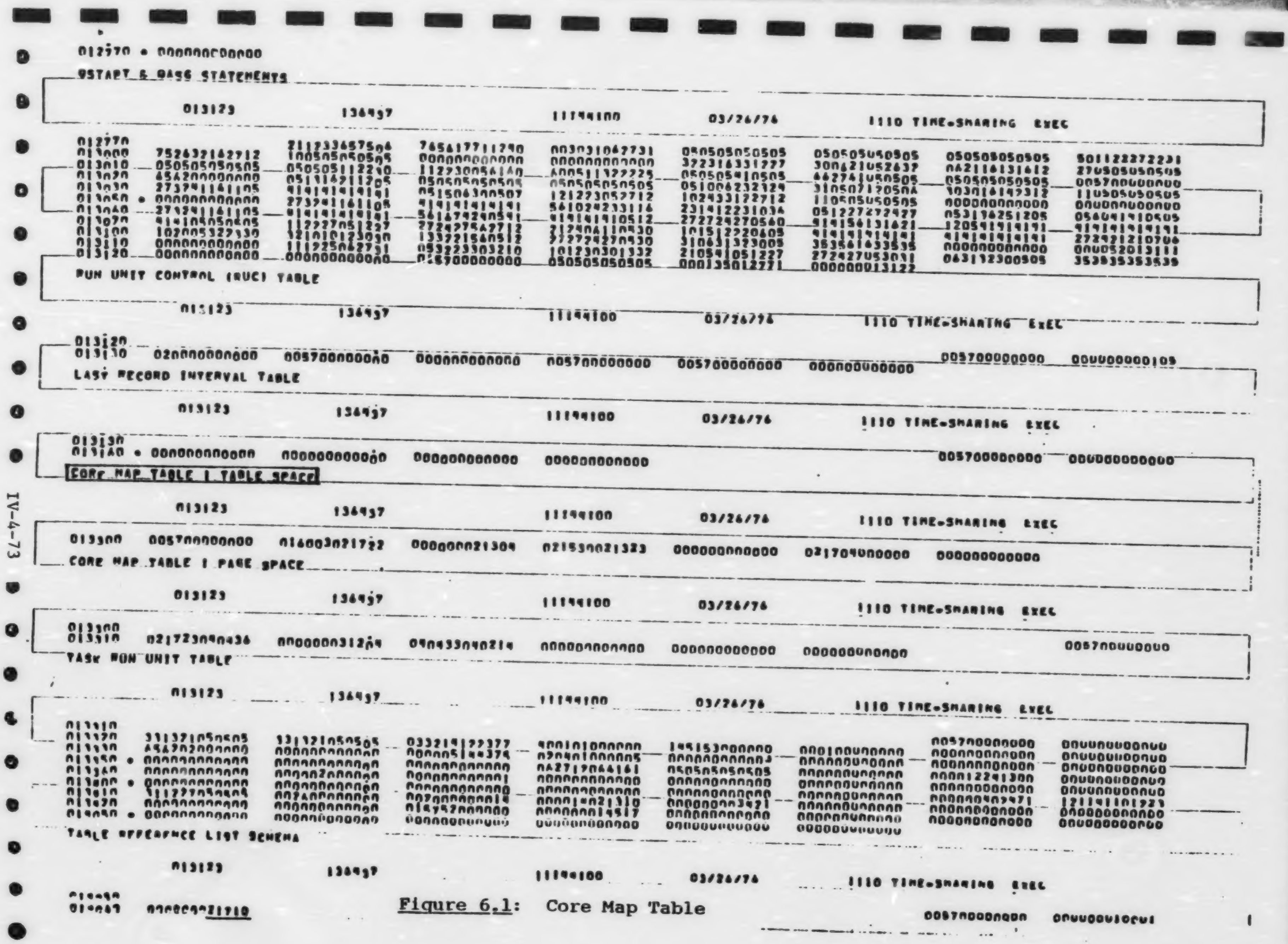
UNIVERSAL QUALIFIER              DMS
SYSTEM GENERATION PARAMETER SETTINGS

            013123          136437           11193159        03/26/76         1110 TIME-SHARING  EXEC

019970                                 768617711290
QUICK LOOK FILES - EXECA

            013123          136437           11194100        03/26/76         1110 TIME-SHARING  EXEC

012730                                                                  005700000000   000000000011   000101013340   002400000000
012740    000201000000   002400002400   000301000000   002400005000   000401000000   002400007400   000501000000   002400012000
012750    000602000000   005000000000   000702000000   005000005000   001002000000   005000012000   001102000000   006000017000
012760    001202000000   005000025000   263216102091   212424206105   263216102091   212424206205   005700000000   000000000000
```



```
012770 • 000000000000
@START & PASS STATEMENTS
            013123         136437              11144100        03/26/76        1110 TIME-SHARING  EXEC

012770                 211233657504  765417711290  003031042731  050505050505  050505050505  050505050505  501122272231
013000   752632162712  100505050505  000000000000  000000000000  372316331777  300621052637  062116131612  270505050505
013010   050505050505  050505112210  112730056140  600511122225  050505410505  662741050505  050505050505  005700000000
013020   654200000000  051314211205  050505050505  050505050505  051006232324  310507120504  103016142312  110505050505
013030   273741161105  414141414141  051506300507  121223052712  102433172712  110505050505  000000000000  000000000000
013050 • 000000000000  273741161108  414141414141  561024233116  231412231036  051227272427  053136251205  056041410505
013040   273741161105  414141414141  561674240541  414141410512  272724270560  414156131621  120541414141  414141414141
013070   414105050505  112227051227  272427547712  212406110530  101512220605  414141414141  414141414141  272421210706
013100   102005322330  121010123030  133721540512  272724270530  310631323005  353561633535  000000000000  000520131111
013110   000000000000  111225062731  053223303210  101230301332  210541051227  272427053031  063112300505  353535353539
013120   000000000000  000000000000  016700000000  050505050505  000135012771  000000013122
RUN UNIT CONTROL (RUC) TABLE

            013123         136437              11144100        03/26/76        1110 TIME-SHARING  EXEC

013120                                                                                        005700000000  000000000105
013130   020000000000  005700000000  000000000000  005700000000  005700000000  000000000000
LAST RECORD INTERVAL TABLE

            013123         136437              11144100        03/26/76        1110 TIME-SHARING  EXEC

013130                                                                                        005700000000  000000000000
013140 • 000000000000  000000000000  000000000000  000000000000
CORE MAP TABLE I TABLE SPACE

            013123         136437              11144100        03/26/76        1110 TIME-SHARING  EXEC

013300   005700000000  016003021722  000000021304  021530021323  000000000000  021704000000  000000000000
CORE MAP TABLE I PAGE SPACE

            013123         136437              11144100        03/26/76        1110 TIME-SHARING  EXEC

013300                                                                                                      005700000000
013310   021723040436  000000031204  040433040214  000000000000  000000000000  000000000000
TASK RUN UNIT TABLE

            013123         136437              11144100        03/26/76        1110 TIME-SHARING  EXEC

013310                                                                                        005700000000  000000000000
013320   331321050505  331321050505  033214122377  400101000000  145153000000  000100000000  000000000000  000000000000
013330   654202000000  000000000000  000005144374  020401000005  000000000003  000000000000  000000000000  000000000000
013350 • 000000000000  000000000000  000000000000  042717064161  050505050505  000000000000  000012241300  000000000000
013340   000000000000  000002000000  000000000001  000000000000  000000000000  000000000000  000000000000  000000000000
013400 • 000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000402471  121141101723
013410   311272050505  002400000000  002000000014  000014021310  000000003471  000000000000  000000000000  000000000000
013420   000000000000  000000000000  016752000000  000000014517  000000000000  000000000000  000000000000  000000000000
014050 • 000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
TABLE REFERENCE LIST SCHEMA

            013123         136437              11144100        03/26/76        1110 TIME-SHARING  EXEC

014040                                                                                        005700000000  000000010001
014047   000000021710
```

Figure 6.1: Core Map Table

```
TABLE REFERENCE LIST AREA

               013123        136437                     11144100      03/26/76       1110 TIME-SHARING  EXEC

014060                   005700000000  000000020100  000000021670  000000021650  000000400000  000000000000  000000000000
014140 •   000000000000  000000000000  000000000000
TABLE REFERENCE LIST RECORD

               013123        136437                     11144100      03/26/76       1110 TIME-SHARING  EXEC

014160                                               005700000000  000000040100
014170     000000021615  000000000000  000000000000  000000000000  000000000000  000000021691  000000021633  000000021625
014260 •   000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
TABLE REFERENCE LIST SET

               013123        136437                     11144100      03/26/76       1110 TIME-SHARING  EXEC

014260                                                                             005700000000  000000060226  000000021605
014270     000000021574  000000021544  000000021554  000000021544  000000021534  000000000000  000000000000  000000000000
014510 •   000000000000  000000000000  000000000000  000000000000  000000000000
BLOCK USAGE TABLE

               013123        136437                     11144100      03/26/76       1110 TIME-SHARING  EXEC

014510                                                                             005700000000  000000015643  000000034614
014520     175100100000  000000000000  000000000000  000000031210  175100200000  000000000000  000000000000  000000000000
015640 •   000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
RECORD CURRENCY LOCK TABLE

               013123        136437                     11144100      03/26/76       1110 TIME-SHARING  EXEC

015640                                                                                                         000000015650
015650     000000000000  000000000000  000000015653  000000000000  000000000000  000000015656  000000000000  000000000000
015660     000000015661  000000000000  000000000000  000000015664  000000000000  000000000000  000000000000
6507 TS CONTROL

               013123        136437                     11144100      03/26/76       1110 TIME-SHARING  EXEC

015730     005700000000
CONNECTION MATRIX

               013123        136437                     11144100      03/26/76       1110 TIME-SHARING  EXEC

015660                                                                                                         000000000000
015670 •   000000000000  000000000000  000000000000  000000000000
CONNECTION MATRIX WORK SPACE

               013123        136437                     11144100      03/26/76       1110 TIME-SHARING  EXEC

015670                                                             000000000000  000000000000  000000000000  000000000000
015700 •   000000000000
CONNECTION MATRIX WORK SPACE

               013123        136437                     11144100      03/26/76       1110 TIME-SHARING  EXEC
```

IV-4-75

```
015700                    000000000000  000000000000  000000000000  00000000   3  000000000000
QUEUE REASON TYPE TABLE
              013123            136937                   11144100          03/26/76          1110 TIME-SHARING  EXEC

015700
015710  010100000000  000000000000  000000000000  000000000000  000000000000  000100000000  210000000000  010100000000
015720  000000000000  000100000000  010100000000  000100000000  000100000000  000000000000  000000000000  000000000000
                                                                                            000000000000  000000000000
INIT LOAD LAST PAG RECOV TABLE

              013123            136937                   11144100          03/26/76          1110 TIME-SHARING  EXEC

015730                  005700000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
015740 • 000000000000   000000000000  000000000000  000000000000  000000000000
ROLLBACK CONTROL TABLE

              013123            136937                   11144100          03/26/76          1110 TIME-SHARING  EXEC

015740
                                                                                005700000000  000000000000
RUN UNIT QUEUE TABLE

              013123            136937                   11144100          03/26/76          1110 TIME-SHARING  EXEC

015740
015750   000000000009  000000000000  005700000000  070000000000  000000000000  000000000000  000000000000  005700000000
015760   000000000000  000000000000  000000000000  000000000000  005700000000  000000000000  000000000000  005700000000
015770   000000000000  005700000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
016000 • 000000000000  000000000000  000000000000                              000000000000  005700000000  000000000000
DYNAMIC TABLE AREA

              013123            136937                   11144101          03/26/76          1110 TIME-SHARING  EXEC
```

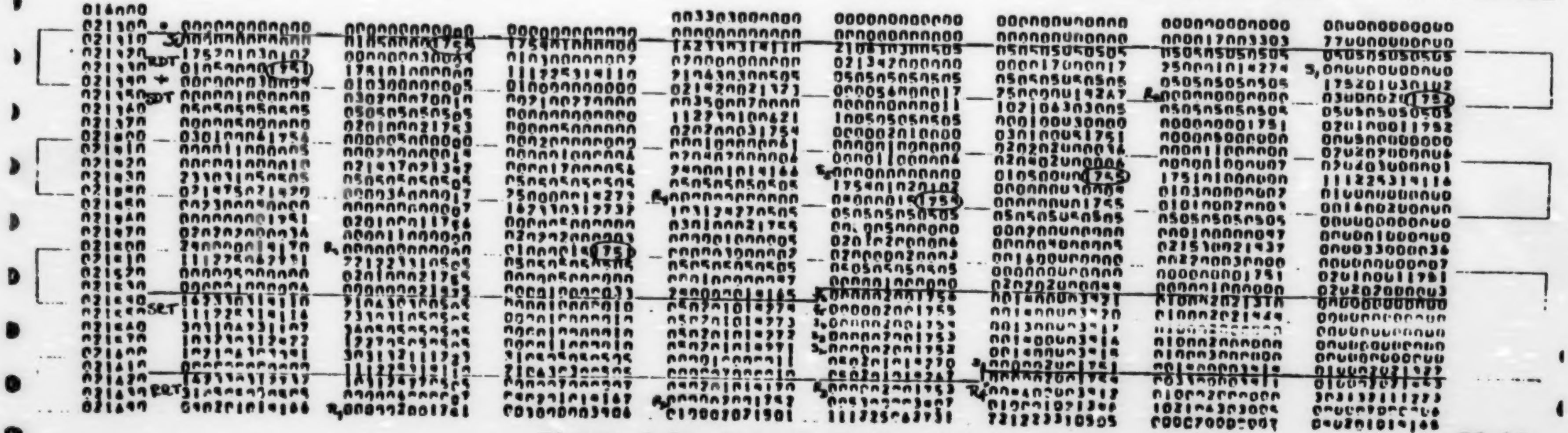


Figure 6.2: Dynamic Table Area

```
021650    000002001752 A1  000000000000  012533000000  062712066262  050505050505  040001003400  000000000000  000000000000
021660 ACT000001117000     000012000000  000000000007  014407000001  000000000001  000000000000  000020000020  030201014067
021670    000002001751 Ax  000001000000  012533000001  062712066161  050505050505  040001003400  000000000002  000005000000
021700    000001117000     000012000000  000000000002  014407000001  000000000001  000000000000  000013000020  030201014063
021710    000002000000     021400003401  010000040220  121141101223  311227050505  000000000000  000000000000  000000000000
021720    000000003400     000000000013  010201014060
PAGE AREA (EXEC 8)
```

Scheme Reference Table

```
          013123              136437              11194101              03/26/76              1110 TIME-SHARING  EXEC

021720                                                007263000000  000000000000  000000000000  000000000000  000000000000
031200 •  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  003404007263  770000000000
031210    000000000000  175100000002  003400003344  000001000033  331321050505  033214122377  000000000005  175100200001
031220    000000000000  000000000000  175250000021  175100200001  175100200001  175100200001  175100200001  175100100001
031230    000000000000  175100200000  122117221223  310627360511  043106052527  291012303016  231405050505  664061406461
031240    607140416765  616263616765  600505050505  000000003144  000000000000  000000000000  000000000000  000000000000
034400 •  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  040001000012
034410    000003000000  040433040214  003404003404  000000014523  000000000000  175100000001  003400003340  000070000036
034420    331132105050  033214122377  000000000005  000000000000  000000000000  000000000000  175110000012  175100200001
034430    175100100002  102422253231  122705301016  122310120505  050505050505  050505050505  050505050505  664061050505
034440    175410000012  175100100002  175100100001  220410051306  111117230522  062736050505  050505050505  050505050505
034450    664061456047  616263050505  000000001340  000000000000  000000000000  000000000000  000000000000  000000000000
040210 •  000000000000  000000000000  040002000024  040001000012  000003000000  034610000000  000217003404  400001014517
040220    000000000000  000000000000  000000000000  005600000022  000000000000  000000001430  000200040006  000000000000
040230    000000130002  000000170004  000001070006  111700001751  000000000000  000000000000  000000000000  064712066161
040240    050505050505  003400003325  000012000000  000000000002  014407000001  111700001757  000000000000  000000000000
040250    000000000000  062712066262  050505050505  003400003325  000120000000  000000000007  014407000001  000000001751
040260    003000000006  000000000000  000000000000  111225062731  221223310505  050505050505  050505050505  050505050505
040270    003100000024  000000001757  005300000007  000000000000  000000000000  102106303005  050505050505  050505050505
040300    050505050505  050505050505  004600000025  000000001753  004600000012  000000000000  000000000000  303132111723
040310    310505050505  050505050505  050505050505  050505050505  007400000031  000000001754  003300000011  000000000000
040320    000000000000  162133031772  103124270505  050505050505  050505050505  050505050505  004000000027  050100001751
040330    001400000014  000000000000  000000000000  111225314110  210630300505  050505050505  050505050505  050505050505
040340    050100001752  001400000015  000000000000  000000000000  102106303041  303132111273  310505050505  050505050505
040350    050505050505  050100001753  001400000016  000000000000  000000000000  101323312422  122705050505  050505050505
040360    050505050505  050505050505  020100001754  001300000017  000000000000  000000000000  303106231107  360505050505
040370    050505050505  050505050505  050505050505  050100001755  001400000020  000000000000  000000000000  111425314116
040400    233031050505  050505050505  050505050505  050505050505  050100001756  001400000021  000000000000  000000000000
040410    162330314110  210630300505  050505050505  050505050505  050505050505  000000000000  000000000000  000000000000
040430 •  000000000000  000000000000  000000000000  000000000000  000000034610  000000000217  210000014040
STATISTICS

          013123              136437              11194102              03/26/76              1110 TIME-SHARING  EXEC

040430
040730 •  000000000000  000000000000  000000000000                                                        000000000000

PRWORK    013123              041544              11194102              03/26/76              1110 TIME-SHARING  EXEC

145150                                                000047143677  000024143746  000000146011  000004146011  000000146015
145160    000003146015  000000143772  000000143657  012572000424  000000000000  000001000000  000001430002  000000000000
145170    175100100002  175100100002  175117540000  055405440404  000200040004  000000000000  175100100000  000000034614
145200    000000014517  000000135325  013320143644  000005000001  000000000000  000000000000  000000000000  000000000000
145210    000015145211  777777057701  000000000000  000000000005  000001031227  175100100002  000000000000  000000000005
145220    000001031727  175100100002  000000031227  000000000011  175100200001  175100200001  000001103264  000001145435
145230    146005021310  400000021443  000000057404  000000000005  006000000200  006000000400  000000034640  000000000001
145240    000000000000  000000000001  000000000000  000001072676  000001145435  146005021310  400000021443  000000057404
145250    000000000005  000000000000  006000000200  000000034640  000000001754  000000000001  000000000001  000000000000
145260    000001077141  000001145635  146005021310  400000021443  000000057404  000000000005  000000000000  006000000700
145270    000000034640  000000000001  000000001756  400000000000  000000000000  000001112154  145755021443  000001145527
145300    000000145527  000000057404  000001145577  000000000011  000000000033  000000034640  000000001751  000000000000
145310    000000001754  175100100002  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
145440 •  000000000000  000000000000  000000000000  000000000000  000000000000  000000100347  000000000000  000000143634
145450    000000143634  000002143634  000001143634  000001143634  000001143634  000001000001  000000144035  304116233031
145460    273710312427  000000000014  000001115162  000000000001  000000144023  000000007174  007000000033  000000000000
145470    000000000000  000000000001  050505050505  404040404040  000000000000  000000000000  777777777776  000000000764
145500    000020271106  000000000061  000000001200  420040040002  000000000200  000000000001  000000000000  000000000000
145510    000001145731  175100100002  000000000001  000007000001  000000040212  111700003400  000000000000  000000000000
145520    000000000000  000000000000  175500010001  142117521754  000000034640  000000000000  175100100002  040001000000
145530    027107000036  040001000003  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
145650 •  000601154006  050505050505  062712060000  050505050505  000000000000  175100100001  175100100002  000005001754
```

```
145560   004000000200  000000000000  145745071346  000000000001  175100000001  000002000015  000000000010  000002000000
145570   175117110000  175100200000  000000000011  000000000000  000000000000  000000000000  000000000000  000000000000
145600   000001105504  000000041477  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000
145630 • 000000000000  000000000000  000000000000  000000000000  000000000000  000117521754  000117541755  000000000000
145640   000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  000000000000  140001040004
145650   000000000000  000000000000  000000001757  000000000170  000000000000  064712044141  745660011705  000000000000
145730 • 000000000000  234017510002  000000000000  175100100002  000000000000  234017520003  000000000000  000000000000
145740   000000000000  000017510002  000000000000  175100100001  000000000000  000017520003  000000000000  000000000000
145750   010000000000  000017530004  000000000000  000000000000  000000000000  000017540005  000000000000  175100100002
145760   000000000000  000017510002  000000000000  175100100001  000000000000  000017520003  000000000000  000000000000
145770 . 000000000000  000017530004  000000000000  000000000000  000000000000  000017540005  000000000000  000000000000
146000   000000000000  000017550006  000000000000  175100100002  000000000000  000017560007  000000000000  175100100002
146010   010000000000  001751143772  001752144001  001753144012  001754144026  000001143457  000000000014  000003143461
146020   000000000014  000002143643  000000000006
ROLLBACK ERROR
011752
DATA IGNORED - IN CONTROL MODE

REMA
REMA IGNORED - IN CONTROL MODE

BRKPT PRINTS
```

F6-14

IV. 5. DMS OPERATIONS PROCEDURES

5.1. DMS System Initialization

5.1.1. Execute SFINIT

```
ST DMS*DMRMT.SFINIT,,,account-no.
```

Upon completion, SFINIT will display the message:

"DMS-SYS-FILE HAS BEEN INITIALIZED"

SFINIT initializes the system files; i.e. DMS-SYS-FILE. SFINIT should only be executed at the start of DMS initialization. The systems file is revised to reflect changes in the system over time. Consequently, once a database has been loaded, the systems file should not be reinitialized, i.e. SFINIT should not be executed again.

SFINIT will also solicit from the operator the reel number for the first audit trail tape (the tape to be used as audit trail tapes will be assigned by the database administrator) and the type of drive to be used (Uniservo 16).

5.1.2. Execute QLINIT

```
ST DMS*DMRMT.QLINIT,,,account-no.
```

Upon completion, QLNIT will display the message:

"ALL SEGMENTS OF THE QLF ARE INITIALIZED"

QLINIT initializes the quick-look files. QLINIT should be executed at the start of DMS initialization and when a new system is booted. If one is attempting to recover from a DMR abort, one would not execute QLINIT. That is because the quick look files contain information needed by Quick Recovery to restore the database.

5.1.3. Execute QUIREC

```
ST DMS*DMRMT.QUIREC,,,account-no.
```

Upon completion QUIREC will display the message:

"QUICK RECOVERY FINISHED"

QUIREC will initiate TIMER. TIMER will request the assignment of an audit trail tape and write a checkpoint omit after recovery has finished. If no updates to the database have occurred since the previous quick recovery, no audit trail tape will be called for.

5.2. DMS IN A PRODUCTION ENVIRONMENT

5.2.1. Description of Console Keyins

5.2.1.1. II TIMER RC.

Display the current status of active run units within the DMR. For each run unit, the following information is displayed on the system console:

a. run unit identification

b. impart time

c. command sequence number

d. number of page updates

e. error code

f. rollback code

g. status in the DMR

The run unit will be either: (Reference: Queueing Reasons, Figure 1)

a. IN DMR

b. Queued on XX, where XX is an integer from 1 to 17

5.2.1.2. II TIMER DP. Command to dump IV02 and associated buffers.

5.2.1.3. II TIMER II. Command to terminate TIMER if runs active in DMR, in particular, if DMR is hung. This keyin should not be used unless absolutely necessary.

5.2.1.4. II TIMER AF. This keyin causes the current audit trail tape to be freed if no I/O is pending for it. Otherwise the keyin is ignored and an explanation returned to the console. When the tape is freed, the tape unit may be released to the system by the operator.

5.2.1.5. II TIMER AS. This keyin causes the current reel of the audit trail tape to be closed and a new reel mounted and opened. This audit trail reel swap may be initiated at any time while the audit trail tape is assigned.

5.2.1.6. E RUNID. Terminate DMS run unit.

Figure 1 Queueing Reasons in the DMR

1. Core not available (tables)
2. Core not available (pages)
3. Area locked out
4. LRI entry locked out
5. List entry not available
6. Page unavailable (usage lock wanted) because:
    a. old page locks on page
    b. core locks on page - other RU's
    c. alter lock on page - other RU's
7. Page being read (waiting for completion of I/O)
8. Page locked (wanting a core lock)
9. Record held as current - other RU's (update RU wants currency)
10. Page locked out by core allocation
11. RU is in rollback and cannot get core
12. Core not available (TIP pages)
13. Queued on overlay
14. Queued on a particular segment
15. Record held current by update run unit
16. Record currency locks on page by other RU's (wants usage lock)
17. Run unit attempting to open for update the first time and a checkpoint has been requested. Queueing done only if CKPT 6 = ON

5.2.2. DMS Error Recovery Procedures

5.2.2.1. Hung run units - (e.g. looping run unit; run unit timeout)

a. All hung run units should be E'd from the operators console. If there are any outstanding DMR messages,

0 - RUN UNIT RUNID TIMEOUT. Continue? Y or N

0 - DMR in possible loop. Continue? Y or N

answer message with a Y (run unit may remain active for some time after being E'd. If run unit is no longer acquiring pages then X run unit)

b. If run unit had to be X'd, the operator must II TIMER II, and the DMS system must be re-started

c. If timer was II'd and has not terminated, and is no longer accumulating pages then E TIMER.

5.2.2.2. Re-Starting DMR

a. If DMR was terminated via II Timer II keyin, run QUIREC

ST DMS*DMRMT.QUIREC,,,account-no.

QUIREC will initiate TIMER. TIMER will request the assignment of an audit trail tape and will write a checkpoint on it after quick recovery has finished. If no updates to the database have occurred since the previous quick recovery no tape will be called for. Upon completion QUIREC will display

"QUICK RECOVERY FINISHED"

b. If TIMER was E'd, run DMRCLEAR

```
ST DMR*DMRMT.DMRCLEAR,,,account-no.
```

DMRCLEAR will clear the active run indicators and will allow an automatic buffer recovery by QUIREC. When DMRCLEAR fins, start QUIREC

c. If system failed, run QUIREC (If QUIREC does not display message:

"QUICK RECOVERY FINISHED"

then run DMRCLEAR followed by QUIREC

note: if the system is manually downed, the DMS system should be terminated bt a II TIMER II key-in previous to downing. When system is recovered, the DMS system must be re-started.

5.2.3. Long Recovery

There are three runs that must be employed to utilize the long recovery feature.

2.3.1. DATDUM - this run dumps the specified portions of the data base and the DMS system file to tape at periodic intervals specified by the DBA. To run a data dump

```
ST DMS*DMRMT.DATDUM,,,account-no.
```

DATDUM will call for the dump tape and for the current audit trail tape. DATDUM will also inform the operator of the next audit trail tape to be used. A log of tapes used by DATDUM should be maintained along with the time and date of the dump.

5.2.3.2. CHKREQ

Checkpoints must be written periodically to the audit trail tape. It is the responsibility of the DBA to determine how often checkpoints are to be taken to initiate a checkpoint:

```
ST DMS*DMRMT.CHKREQ,,,account-no.
```

CHKREQ will inform the operator of the date, time and sequence of the checkpoint. This information should be maintained in a log for later reference by the DBA.

5.2.3.3. LONREC

This run actually performs the long recovery up to the checkpoint, specified by the DBA. After recovery is complete a msg will be displated asking whether to continue recovery to the next checkpoint or to stop. The DBA should inform the operator how to respond.

To run long recovery

```
ST DMB*DMRMT.LONREC,,account-no.
```

Long recovery requires at least one tape drive for the audit trail tape. If no drives are available long recovery will abort and display the msf

```
"CAN NOT ASSIGN AUDIT TRAIL TAPE"
```

IV.6. QLP SYSTEMS GENERATION GUIDE

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6.1. Introduction

The following documentation describes the procedure required to generate QLP. This procedure uses the SSG processor operating on a skeleton written in the SYSTREAM language. The skeleton is a series of job control images which, when used in conjunction with variables supplied by the user, are processed to create an updated QLP processor. It was designed and implemented for the specific task of generating QLP.

The skeleton is written so that the build procedure can be either tape oriented or mass-storage oriented depending upon the system generation directives used, and the build process will default to assumed files if SGS directives are not used to specify desired files. These default files are assumed to be either cataloged files or assigned before calling SSG for input files and are temporary files assigned to F2 for output files.

The generated output stream will accomplish the following tasks in the specified order. First, breakpoint file is assigned and the breakpoint generated if so desired. Next all input and output files are assigned and input files are built. An updated PCF is created using all TCF sets specified. All desired elements are then submitted to the PDP, ELT, or ASM processor as appropriate with corrections from the updated PCF. Next, a map to generate a QLP is done only if one is desired. Finally any output files are produced as required through SGS directives.

For special cases, the user may want to modify the skeleton to meet his own needs. This can be easily done by either updating the skeleton prior to calling SSG, by using a SKEL COR in his SSG run or with PRESKEL. If the SKEL COR route is followed, the changes are made via line numbers much as any other symbolic changes with use of the '+' instead of a '-' in column one of the correction card.

6.2. QLP File Definitions

The following set of files are required to build QLP successfully. They can either reside on mass-storage or be retrieved from tape depending upon SGS directives.

The first of these files contains base symbolics. These symbolics will include symbolics for all QLP assembler elements and map elements for each BANK directive.

The second file contains the base proc elements. These are not the ones used to assemble QLP elements, but the base copy to which corrections are applied.

Thirdly there must be a file with base relocatables. This file contains the relocatables used for elements not assembled within the specific build. This field also contains the procs used in assembling.

The fourth file contains the QLP skeleton and the PRESKEL. These skeletons are the ones that appear in field 1 of the SSG statement so it must be present before the SSG processor is called. PRESKEL is used to update the SKELETON.

The fifth file contains the permanent correction file. This file is a program file that contains an element for each QLP symbolic that has a set of corrections necessary to update this element to the latest release level QLP.

The sixth set of files contains the temporary correction files. These files consists of up to six TCF set files, each containing a temporary correction file in program file format. During a build, the primary temporary corrections are merged with any temporary correction files and finally merged with the permanent correction file to produce the updated correction file. Within this concept, it is easily possible and standard user procedure to accomplish generations using one TCF file against the PCF as is most commonly done under SSG.

The seventh file specifies the file from which the LINKER and DMR (if necessary) are located. The LINKER and DMR from this file are then used when mapping to produce a QLP.

6.3. SSG and Skeleton

6.3.1 SSG Processor Call Card

The SSG processor is called by the following control language:

```
@SSG,options param-1,param-2,param-3,
param-4,param-5,param-6,param-7,...,param-n
```

The allowable options for QLP are as follows with an '*' indicating required options.

Option	Description
A	Generates desired output stream regardless of no-find references.
B	Does not @ADD the final output stream to the main runstream.
C	Double spaces all printing.
D	Used with E option to produce the revised skeleton printing without indentation and preliminary error checking.
E	Prints revised skeleton stream in an indented form and causes SSG to do preliminary error checking on the revised skeleton.
F	Prints permanent input streams (PCF set).
G	Prints temporary input streams (all TCF sets).
H	Prints revised temporary stream.
I	Prints stream generation statement streams.
J	Prints only those elements for which there are primary temporary corrections at the conclusion of skeleton processing. (The presence of *element/version in the primary TCF is sufficient to cause a printout of that element's PCF.) The page is rejected for each element printed out. The P option must be used. The R option is not necessary when the J option is used.
M	Debug. Prints trace of images in the skeleton as they are processed.

Option	Description
N	Debug. Prints values of variables and expressions of the directives being processed.
*P	PCF set entries are to be composed of the symbolic element entries from a program file specified after param-6 on the @SSG call.
R	Print updated PCF set entries from the specified program file as they exist at the end of the skeleton processing. A program file must have been used in conjunction with the P option.
S	Order SSGs with the same label in ascending alphabetical order according to the first subfield of each statement.
*T	TCF set entries are to be composed of the element entries from a program file specified after param-6 on the @SSG call (one program file per TCF set).
V	Generates the desired output stream in fieldata.
W	Generates the desired output stream in ASCII.
X	Used in conjunction with any combination of the S option causes an extensive sort which will order numbers in ascending order.

The field specifications are defined as follows:

param-1	Specifies the source of the skeleton stream (may be ASCII, fieldata, or mixed ASCII-fieldata mode).
param-2	Specifies the source of the SGS stream (may be ASCII, fieldata, or mixed ASCII-fieldata mode); or a program file which is to have its element entries placed under a given SGS label (format: <filename>./<label>).

Option	Description
param-3	Specifies the destination of desired output stream.
param-4	Specifies the destination of the revised temporary stream. These images will be in the same mode (ASCII or fieldata or mixed ASCII-fieldata) as the temporary image they are derived from.
param-5	Specifies the destination of the revised skeleton stream. These images will be in the same mode (ASCII or fieldata or mixed ASCII-fieldata) as the skeleton and skeleton corrections are on input.
param-6	Specifies the source of the corrections to the skeleton stream (may be ASCII, fieldata or mixed ASCII-fieldata mode). The control character for the line correction numbers is a plus sign (+).
param-7	The first of a variable number of inputs. The format is as follows (must always start at param-7): PCF TCF /1,name-1 SGS TCF setname where PCF, TCF, SGS or TCF setname defines the type of input that follows. This format may be repeated any number of times by placing a comma (,) between name-1 and the next input type. The input may be in ASCII, fieldata, or mixed ASCII-fieldata mode. For PCF or TCF sets, respectively, name-1 must be a program file. TCF setnames allowed in QLP are TCFA, TCFB, TCFC, TCFD, TCFE, TCFF. They must be used in the above order.

6.3.2 Skeleton Corrections

6.3.2.1 Applying CCF's to the Skeleton

To apply CCFs to the skeleton a procedure known as PRESKEL must be used, which creates a new skeleton.

To use PRESKEL the following statements should be used.

```
 1)  @ASG,T TEMPCF.,F

 2)  @ASG,A QPCF.

 3)  @COPY  QPCF.,TEMPCF.

 4)  @ASG,A QSKEL.

 5)  @SSG,TPFGIRKO  QSKEL.PRESKEL,,,,,,PCF/1,TEMPCF.,TCF/1,(TCF
     SET ENTRIES)

 6)  @EOF

 7)  @EOF

 8)  @SSG,TPFGIRKO TSKEL.SKEL,,,,,,PCF/1,QPCF.,TCF/1,(TCF SET
     ENTRIES)

 9)  SGS

10)  NORMAL BUILD PARAMETERS

11)  @EOF

12)  @EOF
```

Where Statement Number

1 Assign a temporary work file.

2 Assign the input PCF for BUILD.

3 Copy input PCF to work file.

5 The element PRESKEL from the file QSKEL is the skeleton to be used for merging skeleton corrections only.

8 Normal system build using QPCF as the permanent correction file in build. TSKEL is a temporary file created by PRESKEL containing updated skeleton.

10 Insert user SGS directives for build.

6.3.2.2 Temporary Corrections to the Skeleton

The normal first character in a skeleton directive is a '*'. Due to processing procedures with System Center for CCFs, the character '⌑' (0-8-8) must be substituted for the '*' in column 1 when using cards. The U100 terminal uses the "(Double Quote)" in place of the ⌑ .

6.4. SGS Directives

6.4.1 General

The user can control the generation of QLP via a set of system generation statements. Each statement contains a label and a variable number of fields separated by one or more spaces. It is necessary that the labels be spelled as shown below. The variable fields need not be spelled as shown unless stated so in the description of that directive. Each field can contain a number of subfields separated by commas.

Spaces immediately after commas are permitted. The first non-space character following a comma starts the next subfield. A subfield may contain up to eighteen characters. The slash (/), left bracket ([) and period (.) must not appear as part of a subfield unless the subfield is enclosed in quotation marks.

The semi-colon is used to continue a statement on the following line. The following line must contain a space in the first column.

6.4.2. File Assignment Directives

These SGS directives control file assignments and the initialization of the input files to be used in building a new CLP. This section is divided into two subsections. The first describes those directives that assign and initialize input files. The second subsection describes what if any output files are desired.

6.4.2.1 Input Files

6.2.4.1.1 PCFILE

```
PCFILE  file-name1  [file-name-2]
```

File-name1 specifies the file-name to which the updated permanent corrections are built. File-name2 specifies the original permanent correction file. File-name2 is only used as the first file for an incremental tape build. File-name2 should not be specified if a release tape is being built. If file-name 2 is not specified file-name 1 is used in its place.

If PCFILE is not used the update permanent correction file is assumed to be in a file QLPPCF. In this case it is the users responsibility to either specify QLPPCF as the PCF on his SSG call card or equate QLPPCF to his permanent correction file before the desired output stream is executed.

6.4.2.1.2 SKEL

SKEL file-name

File-name specifies the file in which the QLP skeleton resides. This file is only necessary if a release tape or incremental tape is being built.

If SKEL is not used the default is assumed to be QSKEL.

6.4.2.1.3 INPUT

```
INPUT    RB, [filename1[,device-type],pack-id]]]
        [DMS, [filename2[,device-type],pack-id]]]
        [SYM, [filename3[,device-type],pack-id]]]
       [PROC, [filename4[,device-type],pack-id]]]]]]
```

This directive specifies what input files are to be used to build QLP. In all cases if the device-type is not specified an @ASG,A file-name will be generated for this file which assumes the file is previously catalogued by the user. If the pack-id is specified it is assumed to be a valid disc pack-id for the system. If a device-type is specified an assign of a temporary file called file-name to the specified device type will be generated.

The default files assumed if the INPUT directives are not specified are QRB, QDMS, QSYM and QPROC respectively. These files are assigned with an 'A' option, so they must have been catalogued by the user prior to execution of the desired output stream. If any file specifications are omitted (DMS, PROC, etc.), all following file specifications must be omitted. For example, if DMS is omitted, then SYM and PROC must not be present.

If the INPUT directive is not specified and the MASTER directive is specified temporary files are assigned. These files are assigned to fastrand with filenames IRB, IDMS, ISYM and IPROC, respectively.

6.4.2.1.4 MASTER

MASTER [file-name]

If file-name is specified the master tape is assumed to be preassigned with this name. Otherwise the tape is assumed to have been assigned with the file-name of MASTER.

This directive causes the relocatable, absolute, symbolic and proc files to be copied from a standard incremental or release tape to the appropriate files to be used in the building of a new QLP.

6.4.2.1.5 INITIALIZE

```
INITIALIZE  SYM[,file-name1]  [PROC[,file-name2]
            [RB,[file-name3]  [DMS,[file-name4]]]
```

This directive causes all file-names specified to be COPYed into the appropriate file, where SYM represents the base symbolic file for QLP, PROC represents the proc file for QLP, RB represents the base relocatable file for this particular build and DMS represents the file in which the LINKER and DMR to be used in the map of QLP.

All file-names specified will be FREEd upon completion of the COPYs to the appropriate file.

6.4.2.2 OUTPUT Files

6.4.2.2.1 QTCF

```
QTCF {TAPE}  file-name [,device-type [,pack-id/reel number]]
     {FILE}
```

This directive will save the merged TCF to the file-name specified in field-2. The file-name will be assigned as a temporary file using the device-type and pack-id or reel number if specified. Otherwise if the TAPE option is used to device type 'T' or if other than TAPE is in second field to device type 'F2'.

The word TAPE must be correctly spelled if a tape is desired, otherwise, mass-storage is assumed.

6.4.2.2.2 QPCF

```
QPCF {TAPE}  file-name [,device-type [,pack-id/reel number]]
     {FILE}
```

This directive is the same as QTCF except that the update permanent correction file is saved.

6.4.2.2.3 OUTPUT

```
OUTPUT    RB [,file-name-1 [,device-type[,pack-id]]]
        [ABS [,file-name-2 [,device-type[,pack-id]]]]
```

The OUTPUT directive specifies the files that the update relocatables and the new QLP absolute will create. The device-type and packid are optional with a fastrand file being assigned if not specified. If file-namel is not specified, a fastrand file with a file name of NEW-RB will be assigned. If file-name2 is not specified, a fastrand file with a file-name of NEW-QLP will be assigned. If file-name-2 is specified, file-name-1 must also be specified.

The default of the OUTPUT directive is not specified is to assign NEW-RB and NEW-QLP as temporary fastrand files to contain the update relocatables and new absolute respectively.

6.4.2.2.4 INCREMENTAL

```
INCREMENTAL  [device-type[,reel-no.]]
```

This directive indicates that an incremental output tape is to be built. If the device-type is specified, it must be a valid type for the system, i.e., 'U' is specified, the system must have seven track tape drives. If reel-no. is not specified a blank will be assigned. If neither device type or reel-no. is specified a blank is assigned with a device type 'T'.

An incremental tape has the following files in COPY format:

1) PCF - permanent correction file
2) TCF - merged temporary correction file
3) RB - update relocatables
4) ABS - new QLP absolute
5) SYM - base symbolics
6) PROC - base procs
7) DMS - LINKER and DMR used in build

6.4.2.2.5 RELEASE

```
RELEASE QLP,[device-type1, reel-no1]SDDL, device-type2
                                          reel-number2
```

This causes a release tape rather than an incremental tape to be built. Device-type2 and reel-no-2 refer to an SDDL tape from which SDDL files are to be copied from. Device-type-1 and reel-no-1 refer to the output Release tape to be generated.

If MASTER is specified device-type 2 and reel-number 2 are optional. In this case, the SDDL files will be COPYed from the master tape.

The format of a release tape is composed of the following files in COPY format:

1) PCF - update permanent correction file
2) TCF - null file
3) RB - update relocatables

4) ABS - new QLP absolute

5) SYM - base symbolics

6) PROC - base procs

7) SKEL - QLP skeleton

8,9,10,11) SDDL files

6.4.3. Listing Options

6.4.3.1 ASMOPT

ASMOPT assembler-options

This directive specifies the listing options that are desired on the @ASM cards generated by the skeleton. In the absence of this directive, the 'SW' options are assumed unless the DEMAND directive is specified. The ASMOPT system generation directive will override the DEMAND directive.

6.4.3.2 PDPOPT

PDPOPT pdp-options

This directive specifies, the listing options that are desired on the @PDP cards generated by the skeleton. In the absence of this directive, the 'L' option is assumed unless the DEMAND directive is specified. The PDPOPT system generation directive will override the DEMAND directive.

6.4.3.3 ELTOPT

ELTOPT elt-options

This directive specifies the listing options that are desired on the @ELT cards generated by the skeleton. In the absence of this directive, the 'S' option is assumed unless the DEMAND directive is specified. The ELTOPT system generation directive will override the DEMAND directive.

6.4.3.4 MAPOPT

MAPOPT map-options

This directive specifies the listing options that are desired on the @MAP cards generated by the skeleton. In the absence of this directive the 'S' option is assumed unless the DEMAND directive is specified. The MAPOPT system generation directive will override the DEMAND directive.

6.4.3.5 DEMAND

DEMAND RUN

This directive will cause the 'N' option to be used on all @ASM, @PDP, @ELT, and @MAP cards generated by the skeleton. The ASMOPT, PDPOPT, ELTOPT, and MAPOPT directives override the DEMAND option for the specific processor for which they apply.

6.4.3.6 BRKPT

$$\text{BRKPT} \begin{Bmatrix}\text{TAPE}\\ \text{FILE}\end{Bmatrix} \quad \text{file-name[,device-type[,reel-no/disc-id]}$$

This directive causes a breakpoint file to be assigned using the file-name, device-type and either reel-number or disc id as specified in directive.

If TAPE is specified the default device type is 'T' and reel-number is a blank. The spelling of TAPE is critical.

If option other than TAPE is found in the second field, the default is to assign a fastrand file.

The @BRKPT to this file is done before file assignments and the return is done after the map is completed. The file is then SYMed to the printer.

6.4.3.7 HEADING

HEADING heading

The skeleton will generate a heading for each call to a processor with the name of the element name being processed followed by 'RETURN LISTING TO XXX'. XXX refers to the heading as specified on the HEADING directive. If the heading option is not specified Q-BIN is used in the heading as XXX.

6.4.4 QLP Build Control Directives

6.4.4.1 DELETE

DELETE element-name

This statement causes the specified element to be deleted from the output relocatable file and from the internal matrix of all QLP symbolics. Multiple DELETE directives may occur in any system generation stream.

6.4.4.2 INSERT

INSERT element-name processor options

This element will insert a new element into the internal matrix of QLP symbolics for this run only. The processor refers to the processor needed to process this element, such as ASM or PDP. Options refers to any option other than the listing option needed to process this element. If the element was a proc for example, the option would be 'A'.

Multiple INSERT directives may occur in any system generation stream.

6.4.4.3 VERSION

VERSION 'literal-1' ['literal-2']

This directive allows the user to specify the sign-on heading for QLP. The heading has the format of two twelve character literals. The first twelve characters being represented by literal-2 and the second by literal-1. If only literal-1 is specified the normal sign-on heading of 'QLP M.nn' will appear as the first literal followed by literal-1. Literal-1 and literal-2 must be twelve character literals.

If VERSION is not used the following heading will be generated: 'QLP n.nn ALTERED'.

6.4.4.4 SYMUPDATE

SYMUPDATE

This directive causes all procs and other symbolics to be updated using the updated permanent correction file. The new symbolics are in a cataloged file called QSYMUP.

This directive also forces all elements to be processed by the ELT, PDP, or ASM processor as required.

6.4.4.5 MAP

$$\text{MAP}\left\{\begin{array}{ll}\text{NONE} & \\ \text{STANDARD} & [\text{DMR}] \\ \text{COMMON} & [\text{DMR}]\end{array}\right\}$$

It is critical that all fields as specified above be spelled correctly. If no MAP directive is specified or NONE appears in the first field no map is done.

If STANDARD appears in the first field, a QLP will be mapped with three IBANK and one DBANK statements. If DMR appears in the second field the DMR will be included in the map, otherwise DMR will be assumed to be a system rep or common bank.

If COMMON appears in the first field, the six IBANKs will be mapped as common banks and seven map statements will be generated. The DMR in the second field has the same effect as in a STANDARD map.

6.4.4.6 SPOPT

SPOPT options

The SPOPT directive specifies the IBANK options to be used on the IBANK statements that generates the scan parse bank.

The default options are 'EMD'.

6.4.4.7 TTOPT

TTOPT options

The TTOPT options

The TTOPT directive specifies the IBANK options to be used on the IBANK statement that generates the task translator bank.

The default option is 'ED'.

6.4.4.8 STOPT

STOPT options

The STOPT directive specifies the IBANK options to be used on the IBANK statement that generates the sort bank.

The default option is 'ED'.

6.4.4.9 DROPT

DROPT options

The DROPT directive specifies the DBANK options to be used on the DBANK statement that generates the driver or QD bank.

The default options are 'ECM'.

6.4.4.10 CTOPT

CTOPT options

The CTOPT directive specifies the IBANK options to be used on the IBANK statement that generates the contingency bank.

The default options are 'ED'.

6.4.4.11 DPOPT

DPOPT options

The DPOPT directive specifies the IBANK options to be used on the IBANK statement that generates the diagnostic processor bank.

The default options are 'ED'.

6.4.4.12 PAOPT

PAOPT options

The PAOPT directive specifies the IBANK options to be used on the IBANK statement that generates the Report Writer Parser.

The default options are 'ED'.

6.4.4.13 PROPT

PROPT options

The PROPT directive specifies the IBANK options to be used on the IBANK statement that generates the Report Writer Pre-Scan.

The default options are 'ED'.

6.4.4.14 NOASM

NOASM

When proc elements are changed the QLP skeleton by default reassembles all elements of QLP. NOASM inhibits this reassembly and causes only the elements with corrections in the primary TCF to be reassembled.

6.4.4.15 NOX

NOX

The final collection will have the X option as a default. NOX inhibits this X option to allow normal termination of a build even if the collector detects errors.

6.4.4.16 SETMIN

SETMIN dbank start

The SETMIN directive allows the user to specify the starting address for the QLP Dbank, DRIVER. If SETMIN is not present and a common bank DMR is to be used the default Dbank start address is 0150000. If DMR is present a default Dbank start address will be supplied by the collector.

This SGS is required if the DMR is common banked and has a higher Ibank address than 0150000. If the number specified is in octal the leading zero must be specified.

6.5. QLP 'INQUIRY ONLY' MAP MODIFICATIONS

If the user wishes to map the QLP so that only inquiry operations are allowed, i.e., so that CREATE, DELETE, and CHANGE queries are not permitted, the following changes must be made to the QLP element SPMAP:

```
@ELT,IL             TCF.SPMAP
-51/1

EQU  SPSCRE/0   .   Turn off CREATE

EQU  SPSCHG/0   .   Turn off CHANGE

EQU  SPSDEL/0   .   Turn off DELETE
```

The system must then be regenerated.

6.6. Mapping with User CALC Routines

If the user's database requires a user CALC routine, the QLP DBANK must be modified via a QLP system generation.

To include the user CALC routines in the QLP DBANK, modifications of the following format must be made to the QLP QDMAP:

```
@ELT,IL             TCF QDMAP
-4

IN        file-name.user-calc-relocatable-name
-7,7
IN        file-name.user-CLSEG$-relocatable-name
```

The format of the user-calc-relocatable-name and user-CLSEG$-relocatable-name are defined in Appendix D of UNIVAC Publication UP-7992 Rev. 1. Since no element may reside in memory at a higher address than QDEXP (QLP's dynamic expandable memory element), the user CALC routines must be mapped in prior to that element.

6.7. Miscellaneous Configurable Parameters

6.7.1 Output Line Length Configuration

The terminal line length and the printer line length are initially configured as 132 columns. The user can configure QLP to assume other line lengths (a multiple of 4 and at least 8 characters) for either the terminal or the highspeed printer. To do this, the user should set ORGLEN and HSPLEN in the element PROCs to the column count for terminal and printer, respectively, and reassemble QLPCTL and SP2OUT.

6.7.2 Contingency Dump Routing

Element CONTINPROCS contains two parameters that can be changed by the user. The text of the heading on the dump can be changed by changing the line 'RETURN TO QBIN', to the desired message. The device that the dump is sent to can be changed by setting DMPDEV to the FIELDATA device name. If these parameters are changed, CCONTIN and QD must be reassembled.

6.8. Examples

6.8.1 Example Overview

The attached example shows how to perform a QLP build. The input will be from a release tape and output is to a new release tape.

The only assumption in this example is that DMS-FILE is a program file containing a DMS LINKER before starting the build. This filename is not required since any filename appearing on the INPUT directive will be used to locate the LINKER mapped with QLP. The other assumption is that the DMR is a system rep. If this is not the case, the DMR must be in the same file as the LINKER and the MAP directive should be as follows:

```
MAP STANDARD DMR
```

This will cause the DMR to be mapped with QLP.

The example uses FILE1 as the permanent correction file (PCF), FILE2 as the temporary correction file (TCF), FILE3 as the skeleton file and IN-TAPE as the master input tape. None of these file names are required.

For the PCF file (FILE1) the following should be noted. First, it must be created as a program file before calling the SSG processor. This is done from a master tape by COPYing file into a preassigned file. The filename used to contain the PCF must appear in param-7 of the SSG statement as PCF/1, filename. If the filename is other than QLPPCF, it must also appear on the PCFILE directive as:

```
PCFILE filename.
```

The temporary correction file (FILE2) to be applied in this example is a program file built before calling the SSG processor. Note that in this example the corrections to the element SP2 consist of a correction to an existing correction, NEWELT is a new element to be added to QLP and PROCS is a new correction to the proc element PROCS. The filename used for the temporary correction file must appear in param-7 fo the SSG statement as

TCF/1 filename

The skeleton file (FILE3) must also be created before calling the SSG processor. It can be COPYed from the seventh file of the master tape. This file must be specified in param-1 of the SSG statement as filename.SKEL. If a filename other than QSKEL is used when a release tape is to be built, the following SGS directive must be specified.

SKEL filename

The master input tape in this example is called IN-TAPE and is used to create the PCF and skeleton files before calling SSG. The filename is variable except that if anything other than MASTER it must appear on a MASTER SGS directive.

```
@SSG,TPFGIRK FILE3.SKEL,,,,,,PCF/1,FILE1.,TCF/1,FILE2.
SGS
PCFILE FILE1
RELEASE
SKEL FILE3
MASTER IN-TAPE
INPUT RB DMS,DMS-FILE
HEADING 'JOHN SMITH'
INSERT NEWELT ASM   "  "
MAP STANDARD
BRKPT FILE OUT-FILE
VERSION 'NEW QLP'
@EOF
@EOF
```

It should be noted that only the 'T' and 'P' options are required to produce a good build of QLP. The other options produce various listings. The order of the SGS directives is completely optional.

V.

NCC'S PMIS IMPLEMENTATION

V. NCC PMIS IMPLEMENTATION

1. DMS 1100 GENERATION

On May 11, 1977 an effort was started to have a DMS 1100 System on the U-1110 by August 1, 1977. J. Obenschain and J. Smith generated a single common banked multi-thread DMS 1100 system. On May 20, 1977 a multiple common banked multi-thread Query Language Processor (QLP) was generated. Minimum checkouts of the processors proved successful. On May 23, 1977 UNIVAC ran benchmark runs against the DMR while also utilizing QLP.

The Subschema Data Definition Language system was not regenerated since the release copy offered the same capabilities.

The checkout of these processors, using canned benchmark runs and data base was successful.

The following are changes that were made to the DMR.

Label	Default	Changed
SCLLEN	1	4
SSLLEN	1	8
MAXREC	1000	2000

The above DMSSCP parameters and current DMR, QLP generations procedures are contained in the following pages.

DMSGEN

```
@ELT,L  CANNED.DMSGENZ
@RUN,D/R 18DMS2/0//,22095DMS,DMS,99,9999/9999.  OBENSCHAIN X
@DELETE,C DMS-PRT3.
@ERS TPF$.
@ASG,UP   DMS-PRT3.,F40/100//1000
@BRKPT PRINT$/DMS-PRT3
@DELETE,C TCF.
@ASG,AX F1.
@ASG,AX F2.
@ASG,AX F3.
@ASG,AX F4.
@ASG,AX F5.
@ASG,AX F6.
@ASG,AX F7.
@ASG,AX F8.
@ASG,AX F9.
@PRT,TL F1.,F2.,F3.,F4.,F5.,F6.,F7.,F8.,F9.
@ASG,T  FCF.,F40
@ELT,LU  F3.USERSGS
-2,2
LIST N,LIST,LIST,N,N,N
@ELT,IL  TCF.FCF
```

```
DMRVER*       EQU   DMRLEV     . CURRENT VERSION OF DMR    EPA-
*SGPC
-107,107-
/ON./OFF./
-168,169-
/1/4/
/1/8/
-202,202-
/1/2/
-263,263
             22095DMS         . REALTIME ACCOUNT NUMBER
PSSWD**                                          ERP-NCC
               SAPSMD         . REAL TIME USER-ID
@EOF
@ADD,P  F3.DMSUP
@ASG,TF/W OUT.,16N,100565
@COPY,GM F1.,OUT.
@COPY,GM F2.,OUT.
@COPY,GM F3.,OUT.
@COPY,GM F4.,OUT.
@COPY,GM F5.,OUT.
@COPY,GM F6.,OUT.
@COPY,GM F7.,OUT.
@COPY,GM F8.,OUT.
@COPY,GM F9.,OUT.
```

```
@FREE OUT.

@BRKPT  PRINT$

@FREE DMS-PRT3.

@SYM,U   DMS-PRT3.,,PR

@PRT,TL F1.,F2.,F3.,F4.,F5.,F6.,F7.,F8.,F9.
```

V.2.

```
@ELT,L  UNIVAC*SMIT. OLPGEN
@RUN,D/R  16JES/0/2.22095DMS,DMS,30,5000/5000
ASG,A  DMRMT.
@ASG,A  UNIVAC*TEMPFL.
@ASM,S    UNIVAC*TEMPFL.CERU$,TPF$.CERU$
@PREP  TPF$.
@DELETE,C    QLPABS.
@DELETE,C    QLPREL.
@ASG,CP  QLPREL.,F40/2/POS/20
@ASG,CP  QLPABS.,F40/1/POS/20
@ASG,T   Q1.,F///1000
@ASG,T   Q2.,F///1000
@ASG,T   Q3.,F///1000
@ASG,T   Q4.,F///1000
@ASG,T   Q5.,F///1000
@ASG,T   Q6.,F///1000
@ASG,T   Q7.,F///1000
@ASG,T   @8.,F///1000
@ASG,T   Q9.,F///1000
@ASG,T   Q10.,F///1000
@ASG,T   Q11.,F///1000
@ASG,TJ    IN.,16N,100233
@MOVE   IN.,17
@COPY,G   IN.,Q1.
@COPY,G   IN.,Q2.
@COPY,G   IN.,Q3.
@COPY,G  IN.,Q4.
@COPY,G   IN.,Q5.
@COPY,G   IN.,Q6.
@COPY,G    IN.,Q7.
@COPY,G   IN.,Q8.
@COPY,G   IN.,Q9.
@COPY,G   IN.,Q10.
@COPY,G   IN.,Q11.
@FREE   IN.
@SSG,KFPGIRET  Qy.SKEL......PCF/1,Q1.,TCF/1,Q2.
SGS
NOX
PCFILE Q1
INPUT RB,Q3 DMS,DMRMT SYM.,Q5 PROC,Q6
OUTPUT RB,QLPREL ABS,QLPABS
SKEL Q7
HEADING 'EPA/QLP'
MAPOPT L
MAP COMMON
```

```
VERSION 'MULTI-THREAD'
@EOF
@EOF
@ASG,TJ/W   OUT.,16N,104363
@COPY,GM   Q1.,OUT.
@COPY,GM   Q2.,OUT.
@COPY,GM   QLPREL.,OUT.
@COPY,GM   QLPABS.,OUT.
@COPY,GM   Q5.,OUT.
@COPY,GM   Q6.,OUT.
@COPY,GM   Q7.,OUT.
@COPY,GM   Q8.,OUT.
@COPY,GM   Q9.,OUT.
@COPY,GM   Q10.,OUT.
@COPY,GM   Q11.,OUT.
@MARK OUT.
```

V.3. NCC DATA BASE DESIGN

The design of the Personnel Management Information System began by analyzing the "New Peronnel Data Tape File Extracted From The DIPS Long Query Tape (LRECL = 400 , BLKSIZE = 1200)" for definition of those data which would be incorporated into the NCC data base. Data which had relational commonality (ex: NAME, ADDRESS, etc.) was sequenced together and records defined. As the overall objective of the project was to develop a functional model of the PMIS using DMS 1100/QLP 1100, no pre-editing considerations (such things as optimum field lengths, whether fields contained correct formats or data values) were performed, although such items would normally be considered. Due to Federal privacy considerations, the data was camouflaged by NCC personnel. Other areas to influence the data base design dealt with how programs would process the data, reports to be generated, whether data existed in multiply occurring fields, and whether data had a high or low 'hit' rate as regards processing requirements.

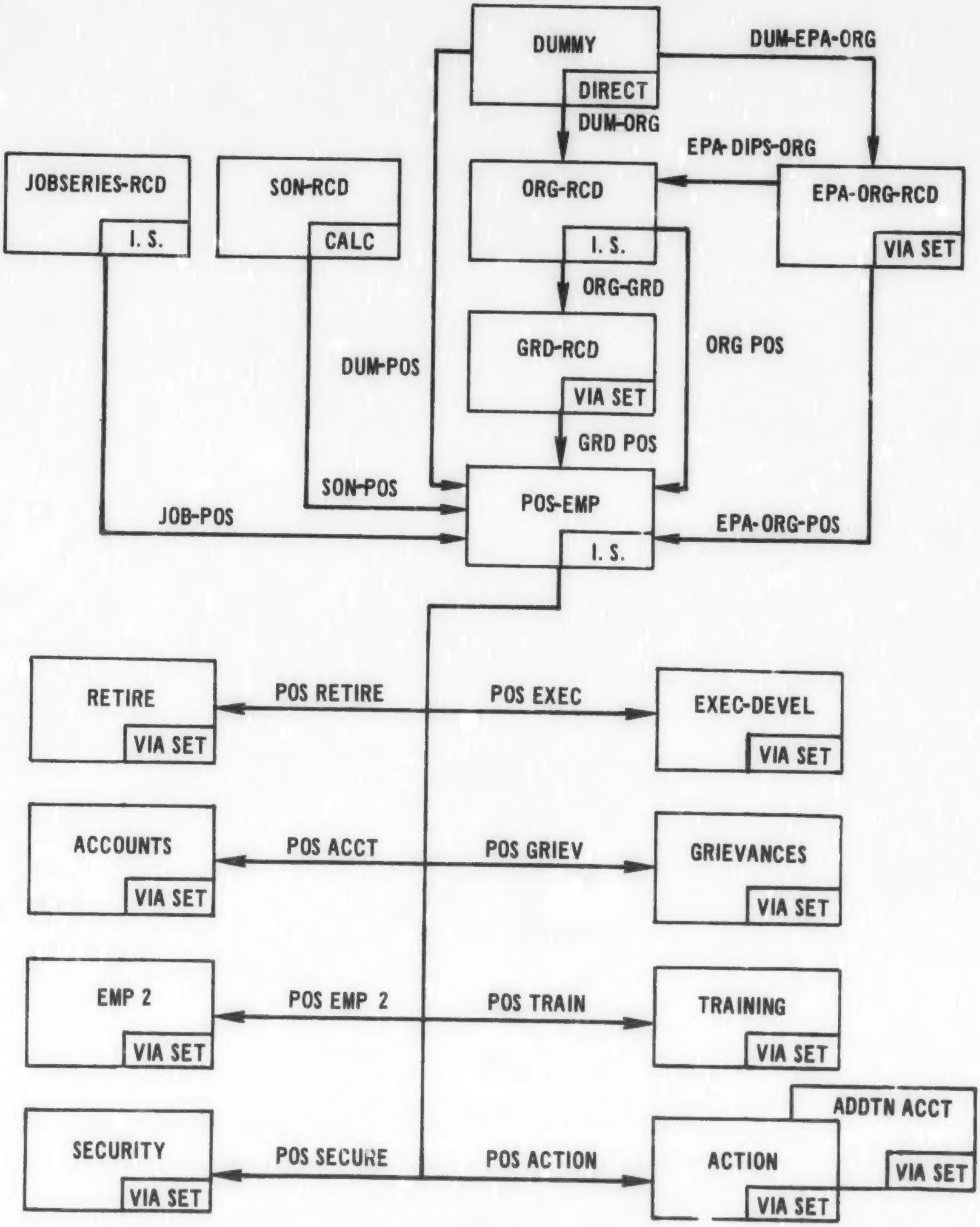
Analysis of the NCC model requirements indicated three types of desirable access; they were random, sequential (sorted) and sequential (no order required). The data base was designed with the above criteria in mind, as well as an eye toward the addition of future personnel data including executive development, grievances, training and security information.

The essence of the project consisted of:

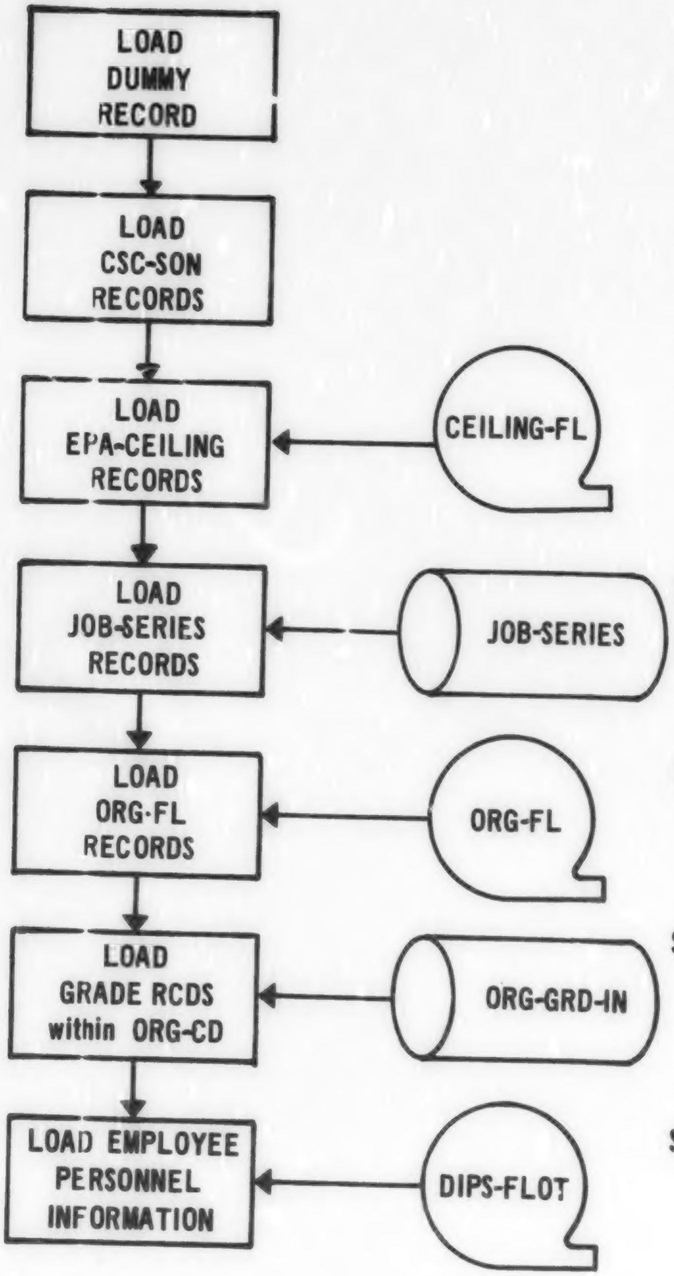
1) designing the data base
2) loading the data base
3) writing of 1 update and 3 report programs
4) the use of QLP for ad hoc queries
5) fine tuning the design of the data base
6) documentation
7) demonstration of prototype PMIS Project

The first of the following two charts depicts a diagram of the data base design. The boxes represent record occurrences within the hierarchical/network design of the data base. The lower right hand corner of each box indicates the major method of sorting the various records. The names associated with the lines between records depict the names of sets used to link various records together. The second chart graphically depicts the procedural steps used to load the data base and associated files.

NCC DATABASE DESIGN LAYOUT


DUMMY
DIRECT
DUM-EPA-ORG
DUM-ORG
EPA-DIPS-ORG
JOBSERIES-RCD
I. S.
SON-RCD
CALC
ORG-RCD
I. S.
EPA-ORG-RCD
VIA SET
ORG-GRD
GRD-RCD
VIA SET
ORG POS
DUM-POS
GRD POS
SON-POS
POS-EMP
JOB-POS
EPA-ORG-POS
I. S.
RETIRE
VIA SET
POS RETIRE
POS EXEC
EXEC-DEVEL
VIA SET
ACCOUNTS
VIA SET
POS ACCT
POS GRIEV
GRIEVANCES
VIA SET
EMP 2
VIA SET
POS EMP 2
POS TRAIN
TRAINING
VIA SET
ADDTN ACCT
VIA SET
SECURITY
VIA SET
POS SECURE
POS ACTION
ACTION
VIA SET

NCC DATABASE LOAD


LOAD DUMMY RECORD
LOAD CSC-SON RECORDS
LOAD EPA-CEILING RECORDS
CEILING-FL
LOAD JOB-SERIES RECORDS
JOB-SERIES
LOAD ORG-FL RECORDS
ORG-FL
LOAD GRADE RCDS within ORG-CD
ORG-GRD-IN
LOAD EMPLOYEE PERSONNEL INFORMATION
DIPS-FLOT

SORT SEQ: 5 digit EPA ORG CD

SORT SEQ: 4 digit JOB SERIES CD

SORT SEQ: 5 digit EPA ORG CD
8 digit DIPS ORG CD

SORT SEQ: 8 digit DIPS ORG CD
2 digit SORT CD
2 digit PAY PLAN
2 digit GRADE LEVEL

SORT SEQ: 9 digit SOC. SEC. NUMBER

As can be see from the 'Data base Design Layout' chart, the PMIS model database, although relatively straight-forward in its concept, incorporates a variety of storage structures including DIRECT, CALC, INDEX SEQUENTIAL and VIA SET. The design provides NCC the ability to access information using a number of different entry points to information.

The programming requirements, as specified by NCC, dictated our approach to designing the database. Additionally, it was decided that it would be desirable to be able to search the database, grouping employee information by either job-series, regional identification or by EPA organizational codes (5 & 8 digits).

The DUMMY record was incorporated into the database design, not merely to provide an entry point into the database, but to facilitate a variety of organizational structures for "lower" records in the hierarchy (i.e., the ability to sort record information in differing orders between various set relationships).

The JOBSERIES-RCD records were stored INDEX-SEQUENTIAL, to facilitate rapid access of job series information. By writing a small program to pre-scan the "New Personnel Data Tape", a number of unique job series codes were identified written out to a mass storage file (to be used during the database load process).

The SON-RCD records identify the various regional offices which handle the personnel files for a given individual. These offices were identified and defined within the load program, and their respective codes were used to load the SON-RCD's via DMS 1100's DMSCALC routine.

The EPA-ORG-RCD information (identified by the CEILING-FL in the DATABASE LOAD diagram) was a card file provided by EPA, Washington, D.C. It consisted of the 5 digit EPA organization code as well as ceiling information for permanent full-time and other than permanent full-time as well as organizational title information. These records were stored via SET.

The ORG-RCD information (identified by the ORG-FL in the DATABASE LOAD diagram) was a card file supplied by EPA, Washington, D.C. It consisted of the 8 digit DIPS organization code, the 5 digit EPA code to which the DIPS organization code was associated and the title associated with the DIPS code. The file was sorted and stored INDEX SEQUENTIAL.

The GRD-RCD's were stored using the ORG-GRD-IN file (reference DATABASE LOAD diagram). This file contains the 8 digit DIPS organization code and all the various pay plans and grade levels within a particular organization code. The GRD-RCD's were stored via set by DIPS organization code.

The POS-EMP data and all subordinate information (RETIRE, ACCOUNTS, etc.) were extracted from the DIPS-FLOT file which consisted of 12,000 plus employee records sorted on social security number. The POS-EMP records were stored in an index sequential fashion and all subordinate records were stored via set. Secondary access to POS-EMP information was available via sets from either JOBSERIES-RCD, SON-RCD, DUMMY, GRD-RCD, ORG-RCD, EPA-ORG-RCD.

With the basic design of the database completed development of the application programs began in parallel with the programming of the database load program. It was determined that for check out of the application programs as well as determining the effectiveness of the database design, only a partial load of the employee data would be performed. Once satisfied with the timings of the application runs and the effectiveness of the database design, we loaded the full database and tested the application programs. All program check out and debug was performed under a single thread version of DMS 1100 LVL 6A. Once satisfied with the integrity of the programs we successfully tested the system under the multi-thread version of DMS 1100.

It might be worth noting at this point that the use of the application programs and QLP assisted in the actual debug and fine tuning of the database design.

Recalling some of the design and redesign considerations:

- It was originally planned to store the JOBSERIES-RCD and SON-RCD records via DMSCALC. The number of SON-RCD's adapted well to CALC storage, however the generalized nature of the DMSCALC routine and the volume of records associated with the JOBSERIES-RCD and EPA-ORG-RCD-records would have required a larger number of data pages to accommodate the spreading of the calc chains. Therefore it was determined that index sequential storage of the JOBSERIES-RCD records would satisfy both storage and fast access considerations.

- The primary storage of ORG-RCD index sequentially guarantees quick access of an organization code and all subordinate information.

- An initial consideration for storing pay plan and grade level information (GRD-RCD) called for having only one unique record for a given pay plan and grade. This approach would have required an extensive amount of overhead in terms of relational pointers and was dropped from consideration. The final design placed unique GRD-RCD information within a given organization code.

- The remainder of the DIPS data was directly related to a given individual and stored accordingly in the POS-EMP record.
- The records subordinate to the POS-EMP records represent variable type information which could be associated with a given individual and designed to avoid waste of storage space if not present on the DIPS input file.

V.4. NCC APPLICATION PROGRAMMING DOCUMENTATION

PROGRAM ABSTRACT

Name: EPA-Personnel-File

Application: SDM

Status: Operational

Number of Source Statements:		
	Program 1	103
	Program 2	784

Program 1: This program converts EBCDIC records to ASCII records.

Program 2: This program updates the basic file (created in program 1) by deleting personnel, adding new personnel and updating any changes to current personnel status.

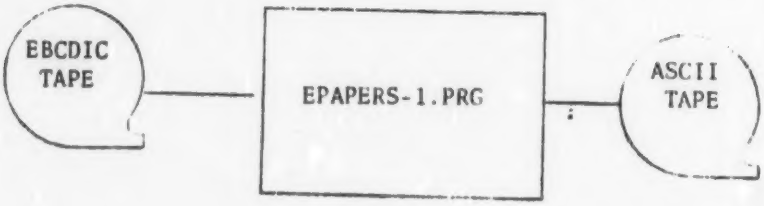
On the above 2 programs employee's name, street address, city and state, and zip code are filled with spaces. Employee's social security number is crypted.

In Program 1, positions 398-403 represent the position number which is numbered in an ascending order beginning at numeric 1.

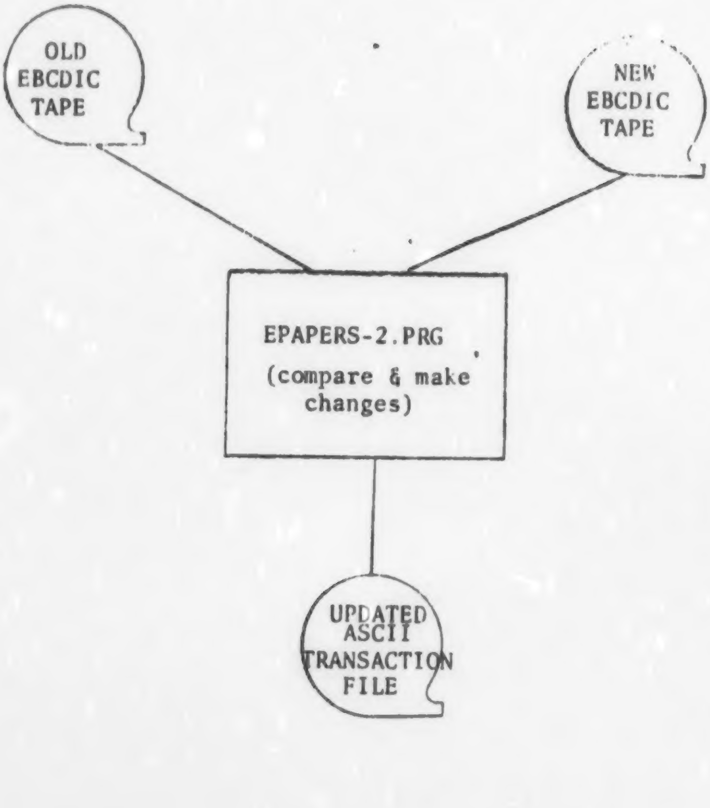
In Program 2, the corresponding position number is 399-404. It is very important that Program 2 be compiled and mapped on each update by changing the data-item named "PN-CTR: with the last position number which will be displayed in each update run. In this update program only new employees are given a position number in positions 399-404.

SYSTEM FLOWCHART

PROGRAM 1

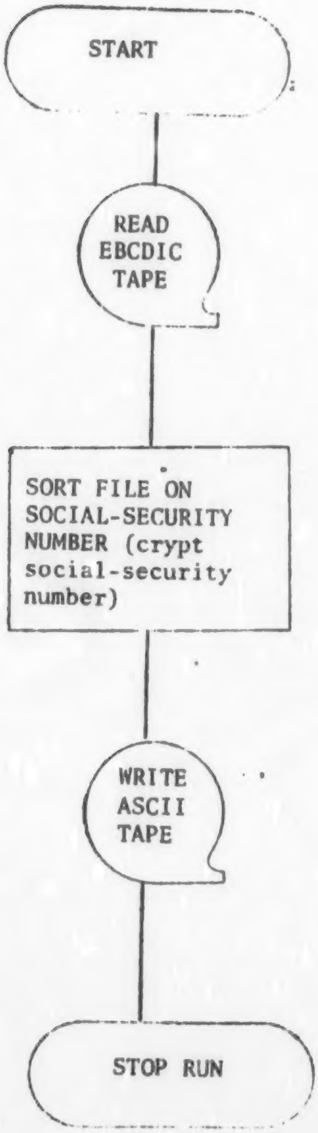

EBCDIC TAPE
EPAPERS-1.PRG
ASCII TAPE

PROGRAM 2


OLD EBCDIC TAPE
NEW EBCDIC TAPE
EPAPERS-2.PRG
(compare & make changes)
UPDATED ASCII TRANSACTION FILE

DETAILED FLOWCHART - 1

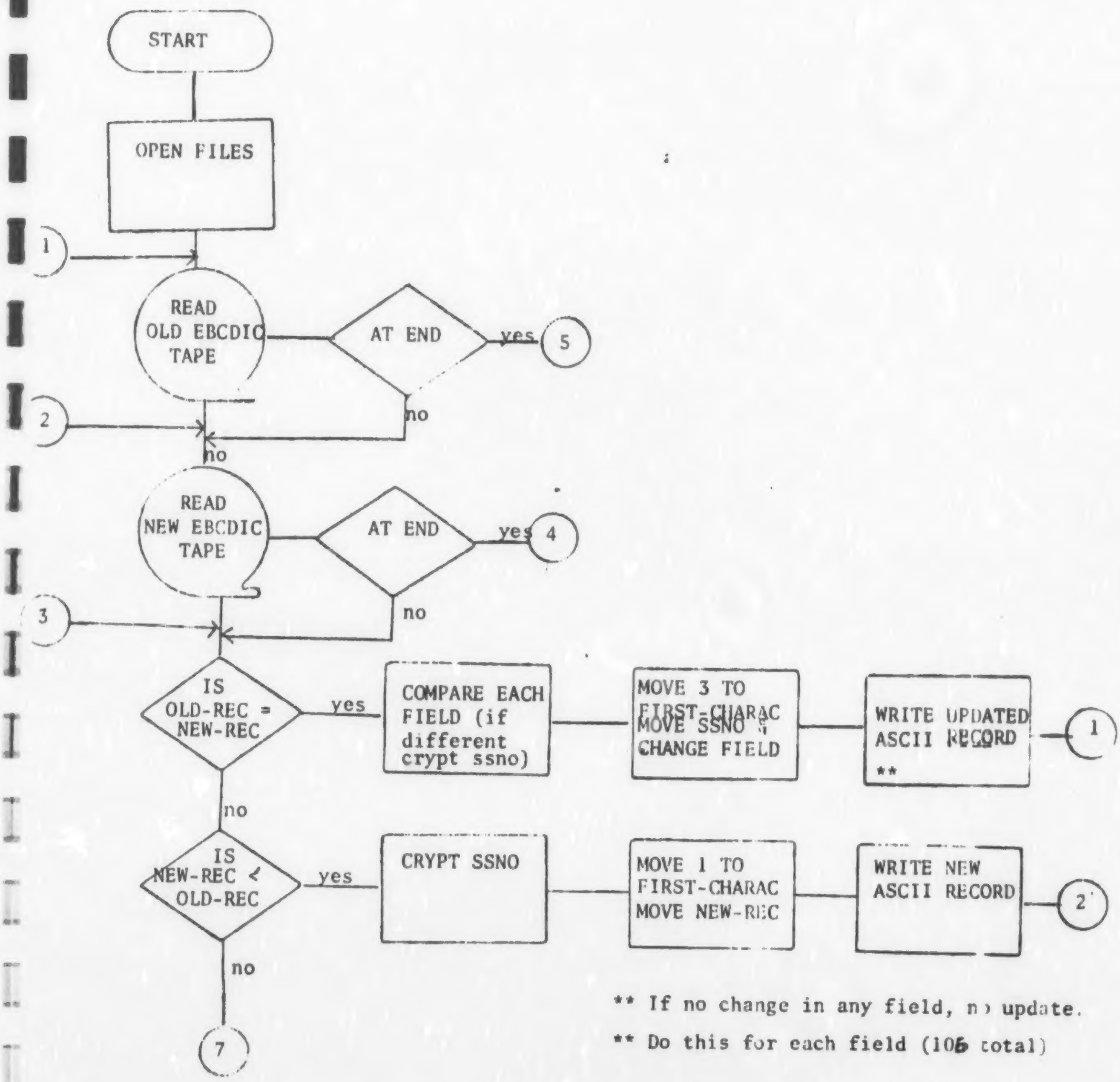
PROGRAM 1


START
READ EBCDIC TAPE
SORT FILE ON SOCIAL-SECURITY NUMBER (crypt social-security number)
WRITE ASCII TAPE
STOP RUN

[redacted]

DETAILED FLOWCHART - 2

PROGRAM 2


START
OPEN FILES
1
READ OLD EBCDIC TAPE
AT END
yes
5
no
2
no
READ NEW EBCDIC TAPE
AT END
yes
4
no
3
IS OLD-REC = NEW-REC
yes
COMPARE EACH FIELD (if different crypt ssno)
MOVE 3 TO FIRST-CHARAC MOVE SSNO & CHANGE FIELD
WRITE UPDATED ASCII RECORD **
1
no
IS NEW-REC < OLD-REC
yes
CRYPT SSNO
MOVE 1 TO FIRST-CHARAC MOVE NEW-REC
WRITE NEW ASCII RECORD
2
no
7

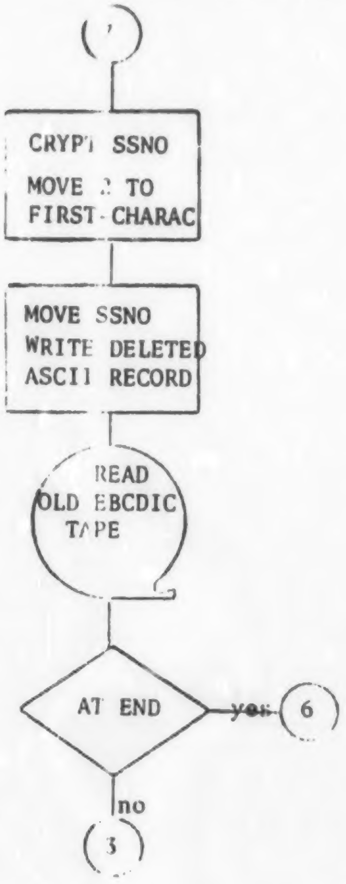
** If no change in any field, no update.

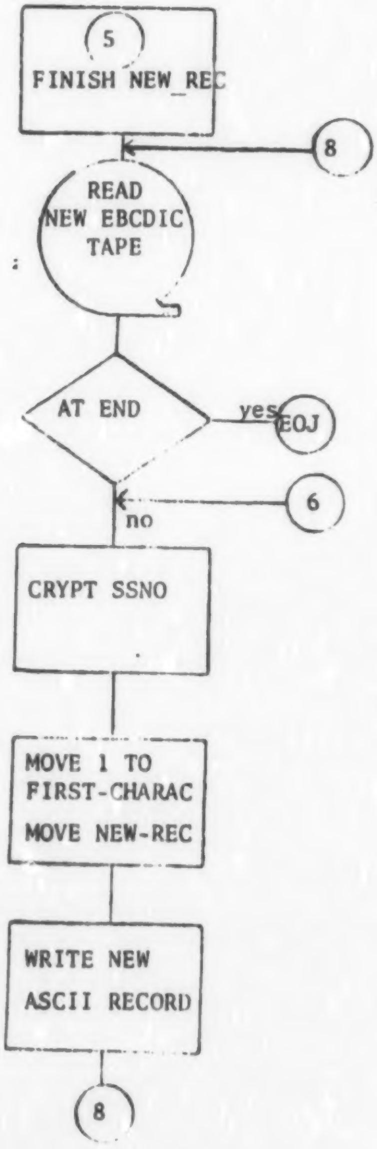
** Do this for each field (106 total)

(The comparison between old-rec and new-rec is made on social-security number (ssno))

DETAILED FLOWCHART - 3

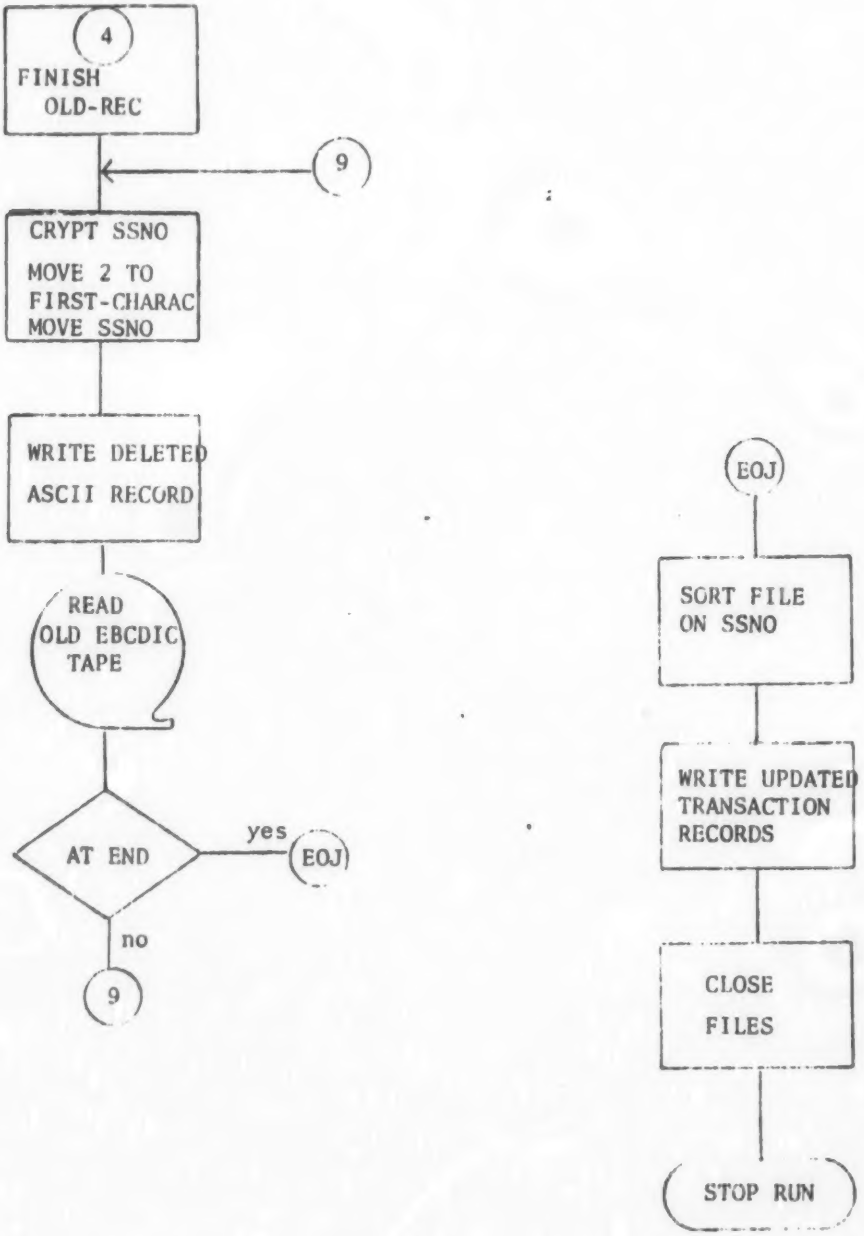
PROGRAM 2 (continued)


7
CRYPT SSNO
MOVE 2 TO FIRST-CHARAC
MOVE SSNO
WRITE DELETED ASCII RECORD
READ OLD EBCDIC TAPE
AT END
yes
6
no
3


5
FINISH NEW_REC
8
READ NEW EBCDIC TAPE
AT END
yes
EOJ
6
no
CRYPT SSNO
MOVE 1 TO FIRST-CHARAC
MOVE NEW-REC
WRITE NEW ASCII RECORD
8

DETAILED FLOWCHART - 4

PROGRAM 2 (continued)


4
FINISH OLD-REC
9
CRYPT SSNO
MOVE 2 TO FIRST-CHARAC
MOVE SSNO
WRITE DELETED ASCII RECORD
READ OLD EBCDIC TAPE
AT END
yes
EOJ
no
9
EOJ
SORT FILE ON SSNO
WRITE UPDATED TRANSACTION RECORDS
CLOSE FILES
STOP RUN

FORMAT OF THE NEW PERSONNEL DATA TAPE [illegible] EXTRACTED FROM THE
DIPS LONG QUERY TAPE. (LRECL=400,BLKSIZE=1200) REPORT.FILE.DESC

START POSIT.	LENGTH	ITEM NAME	START POS L.O. TAPE	LENGTH
1	9	SOCIAL SECURITY NUMBER	3	9
11	25	EMPLOYEE NAME	----	
36	8	ORGANIZATION CODE (8 CHARACTERS)	1304	8
47	18	POSITION TITLE	1465	18
66	5	SERVICE COMP DATE (LEAVE)	1453	6
71	1	PERM-OTHER CODE	1536	1
72	1	TYPE APPOINTMENT CODE	1563	1
75	2	PAY PLAN	1321	2
78	2	GRADE LEVEL	1347	2
80	1	ZERO (0)		
81	2	STEP	1345	2
84	4	OCCUPATION (CLASS)	1497	4
88	9	ACCOUNT #1 (FIXED)	557	9
97	9	GEOGRAPHIC LOCATION CODE	1312	5
107	5	SALARY	1326	3P
113	4	CSC SUB OFFICE	1597	4
119	6	DATE OF BIRTH	771	6
125	1	SEX CODE (M OR F)	1303	1
127	1	SHIFT CODE	1320	1
128	1	RETIRED STATUS	1343	1
129	3P	MONTHLY ANNUITY	1344	3P
132	2	PAYROLL SEPARATION CODE	1619	2
134	6	DATE LAST EQUIV. INCREASE	1376	6
140	6	LIMIT EXPIRATION DATE	1401	6
146	2	DAY LIMITATION	1410	2
148	2	FIXED HOURS #1	566	2

73-74

* SS-KEY

Page 1

OLD-REC **(EBCDIC)**

Block Contains 32 records
Record contains 100 characters.

(Please note 3 fields with packed decimal)

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```
150   9   FIXED ACCOUNT #2                      568    9
159   2   FIXED HOURS #2                        577
151   9   FIXED ACCOUNT #3                      573    9
170   2   FIXED HOURS #3                        583    2
172   9   LEAVE ACCOUNT #                       580    9
121   7   POSITION NUMBER                      1459    7
138   1   POSITION TENURE                      1504    1
189   1   POSITION OCCUPIED CODE                748    1
190   1   POSITION CATEGORY CODE                749    1
191   1   SUPERVISORY/NON CODE                  754.   1
192   3   NATURE ACTION CD #1                  1505    3
195   1   ACTION SHRED OUT CODE #1             1508    1
196   3   NATURE ACTION CD #2                  1509    3
159   1   ACTION SHRED OUT CODE #2             1512    1
200   3   NATURE ACTION CODE #3                1513    3
203   1   ACTION SHRED OUT CODE #3             1515    1
204   3   NATURE ACTION CODE #4                1517    3
207   1   ACTION SHRED OUT CODE #4             1521    1
209   2   ADDITIONS TO NATURE ACTION TERM #1    755    2
210   2   ADDITIONS TO NATURE ACTION TERM #2    757    2
212   6   EFFECTIVE DATE OF ACTION             1545    6
218   1   VETERAN PREFERENCE CODE              1589    1
219   1   SPECIAL EMPLOYMENT CODE               779    1
220   4   DESIGNATED AGENT                      331    4
224   6   EOD BUREAU                            791    6
230   6   DATE LAST PROMOTION                   797    6
236   6   DATE SERVICE TOWARD CAREER            823    6
242   1   SEP CODE (CALC 0 NOT SEP,1 SEP)      1131    1
243   2   TENURE GROUP                         1590    2
245   1   WORK SCHEDULE                        1594    1
246   1   SUMMER EMPL EXAM CODE                1595    1
```

F. 2

247	1	COUNT/SCT COUNT CODE	829	1
248	5	ORG CODE (5 DIGITS)	ORGANIZATION TABLE	
253	9	LOCATION ABBREVIATION	EPA.LOC FILE	
[illegible]	[illegible]	[illegible]	[illegible]	2
264	1	SAVED PATE CODE	1331	1
265	2	FUNCTIONAL CATEGORY CODE	1501	2
267	2	HANDICAP CODE	1592	2
269	1	CITIZENSHIP	777	1
270	1	EMPLOYMENT OBLIGATION	780	1
271	1	RETIREMENT SYSTEM	1824	1
272	3P	DOLLAR LIMITATION	1407	3P
275	3P	HOUR LIMITATION	1412	3P
278	5	ZIP CODE	230	5 —
283	1	POSITION SENSITIVITY	750	1
284	4	FILE LOCATION	787	4
288	6	EMPLOYMENT OFFICE LOCATION	1601	6
294	1	PERFORMANCE RATING	1607	1
295	2	REASON FOR RESIGNATION (QUIT)	1614	2
297	6	DATE PROBATION PERIOD BEGINS	817	6
303	6	SCD (RIF)	803	6
309	2	SPECIAL PROGRAM IDENTIFICATION	1771	2
311	2	EDUCATION LEVEL	549	2
313	4	ACADEMIC FIELD	557	4
317	2	YEAR OF HIGHEST DEGREE	555	2
319	35	EMPLOYEE STREET ADDRESS	277	35
354	18	EMPLOYEE CITY AND STATE	312	18
395	6	DATE CREATED		

FORMAT OF THE NEW PERSONNEL DATA TAPE WILL EXTRACTED FROM THE
OPPS LONG QUERY TAPE. (LRECL=400,BLKSIZE=1200) [illegible]

START POSIT.	LENGTH	ITEM NAME	START POS L.O. TAPE	LENGTH
1	9	SOCIAL SECURITY NUMBER	3	9
11	24	EMPLOYEE NAME	1279	24
36	8	ORGANIZATION CODE (8 CHARACTERS)	1304	8
47	18	POSITION TITLE	1465	18
66	6	SERVICE COMP DATE (LEAVE)	1453	6
71	1	PERM-OTHER CODE	1596	1
72	1	TYPE APPOINTMENT CODE	1563	1
73-74 —75	2	PAY PLAN	1321	2
78	2	GRADE LEVEL	1347	2
80	1	ZERO (0)		
81	2	STEP	1345	2
84	4	OCCUPATION (CLASS)	1497	4
88	9	ACCOUNT #1 (FIXED)	557	9
97	9	GEOGRAPHIC LOCATION CODE	1312	5
107	5	SALARY	1326	3P
113	6	CSC SUB OFFICE	1597	6
119	6	DATE OF BIRTH	771	6
125	1	SEX CODE (M OR F)	1323	1
127	1	SHIFT CODE	1330	1
128	1	RETIRED STATUS	1343	1
129	3P	MONTHLY ANNUITY	1344	3P
132	2	PAYROLL SEPARATION CODE	1619	2
134	6	DATE LAST EQUIV. INCREASE	1376	6
140	6	LIMIT EXPIRATION DATE	1401	6
146	2	DAY LIMITATION	1410	2
148	2	FIXED HOURS #1	566	2

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NEW-REC (EBCDIC)

BLOCK CONTAINS 32 RECORDS
Record contains 400 characters.

(Please note 3 fields with
packed decimal)

Reproduced from best available copy.

150	9	FIXED ACCOUNT #2	568	9
159	2	FIXED HOURS #2	577	2
161	9	FIXED ACCOUNT #3	579	9
170	2	FIXED HOURS #3	588	2
172	9	LEAVE ACCOUNT #	590	9
181	7	POSITION NUMBER	1459	7
188	1	POSITION TENURE	1504	1
189	1	POSITION OCCUPIED CODE	748	1
190	1	POSITION CATEGORY CODE	749	1
191	1	SUPERVISORY/NOS CODE	754.	1
192	3	NATURE ACTION CD #1	1505	3
195	1	ACTION SHRED OUT CODE #1	1508	1
196	3	NATURE ACTION CD #2	1509	3
199	1	ACTION SHRED OUT CODE #2	1512	1
200	3	NATURE ACTION CODE #3	1513	3
203	1	ACTION SHRED OUT CODE #3	1516	1
204	3	NATURE ACTION CODE #4	1517	3
207	1	ACTION SHRED OUT CODE #4	1521	1
208	2	ADDITIONS TO NATURE ACTION TERM #1	755	2
210	2	ADDITIONS TO NATURE ACTION TERM #2	757	2
212	6	EFFECTIVE DATE OF ACTION	1545	6
218	1	VETERAN PREFERENCE CODE	1589	1
219	1	SPECIAL EMPLOYMENT CODE	779	1
220	4	DESIGNATED AGENT	331	6
224	6	EOD BUREAU	791	6
230	6	DATE LAST PROMOTION	797	6
236	6	DATE SERVICE TOWARD CAREER	823	6
242	1	SEP CODE (CALC 0 NOT SEP,1 SEP)	1131	1
243	2	TENURE GROUP	1590	2
245	1	WORK SCHEDULE	1594	1
246	1	SCREEN EMPL LEAV CODE	1595	1

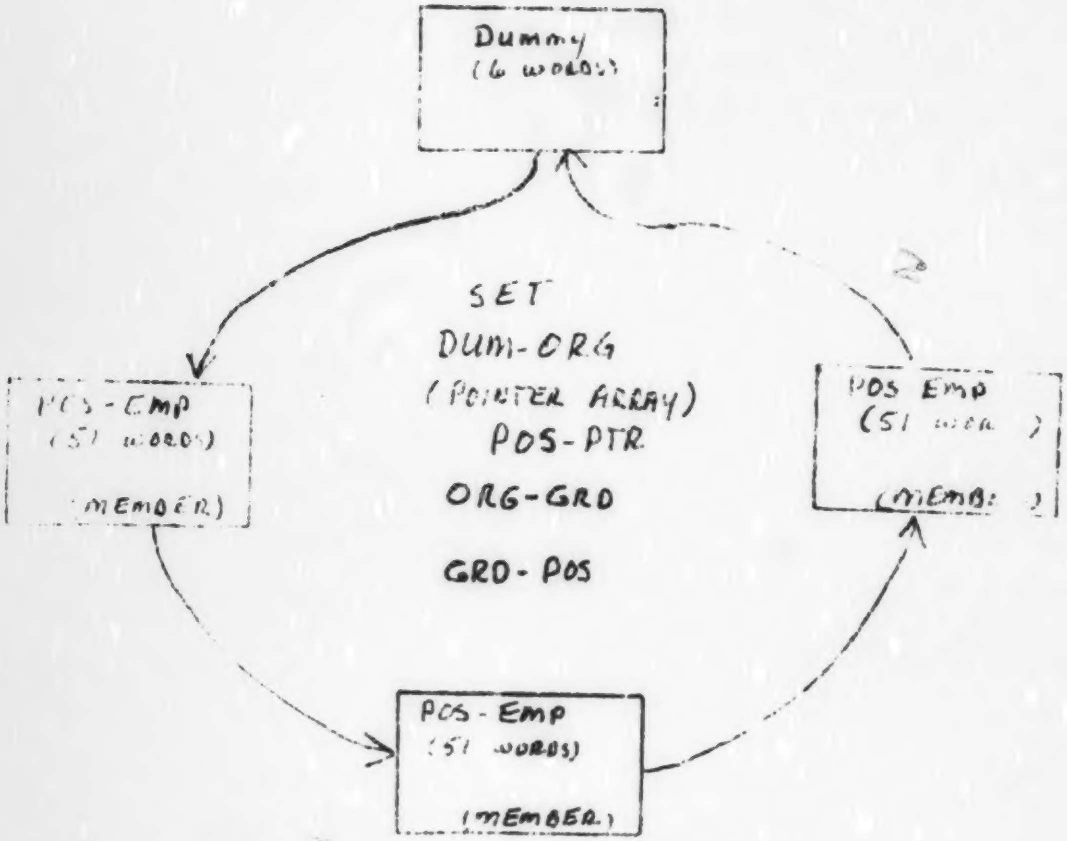
247	1	COUNT/NOT COUNT CODE	829	1
248	5	OPO CODE (5 DIGITS)	ORGANIZATION TABLE	
253	9	LOCATION ABBREVIATION	EPA.LOC FILE	
262	2	SHORTAGE CATEGORY CODE	1329	2
264	1	SAVED RATE CODE	1331	1
265	2	FUNCTIONAL CATEGORY CODE	1501	2
267	2	HANDICAP CODE	1592	2
269	1	CITIZENSHIP	777	1
270	1	EMPLOYMENT OBLIGATION	780	1
271	1	RETIREMENT SYSTEM	1424	1
272	3P	DOLLAR LIMITATION	1407	3P
275	3P	HOUR LIMITATION	1412	3P
278	5	ZIP CODE	239	5 —
283	1	POSITION SENSITIVITY	750	1
286	4	FILE LOCATION	787	4
288	6	EMPLOYMENT OFFICE LOCATION	1601	6
294	1	PERFORMANCE RATING	1607	1
295	2	REASON FOR RESIGNATION (QUIT)	1616	2
297	6	DATE PROBATION PERIOD BEGINS	817	6
303	6	SCD (RIF)	803	6
309	2	SPECIAL PROGRAM IDENTIFICATION	1771	2
311	2	EDUCATION LEVEL	549	2
313	4	ACADEMIC FIELD	557	4
317	2	YEAR OF HIGHEST DEGREE	555	2
319	35	EMPLOYEE STREET ADDRESS	277	35
354	18	EMPLOYEE CITY AND STATE	312	18
395	6	DATE CREATED		

Summary Statistics
Report

Summary Report

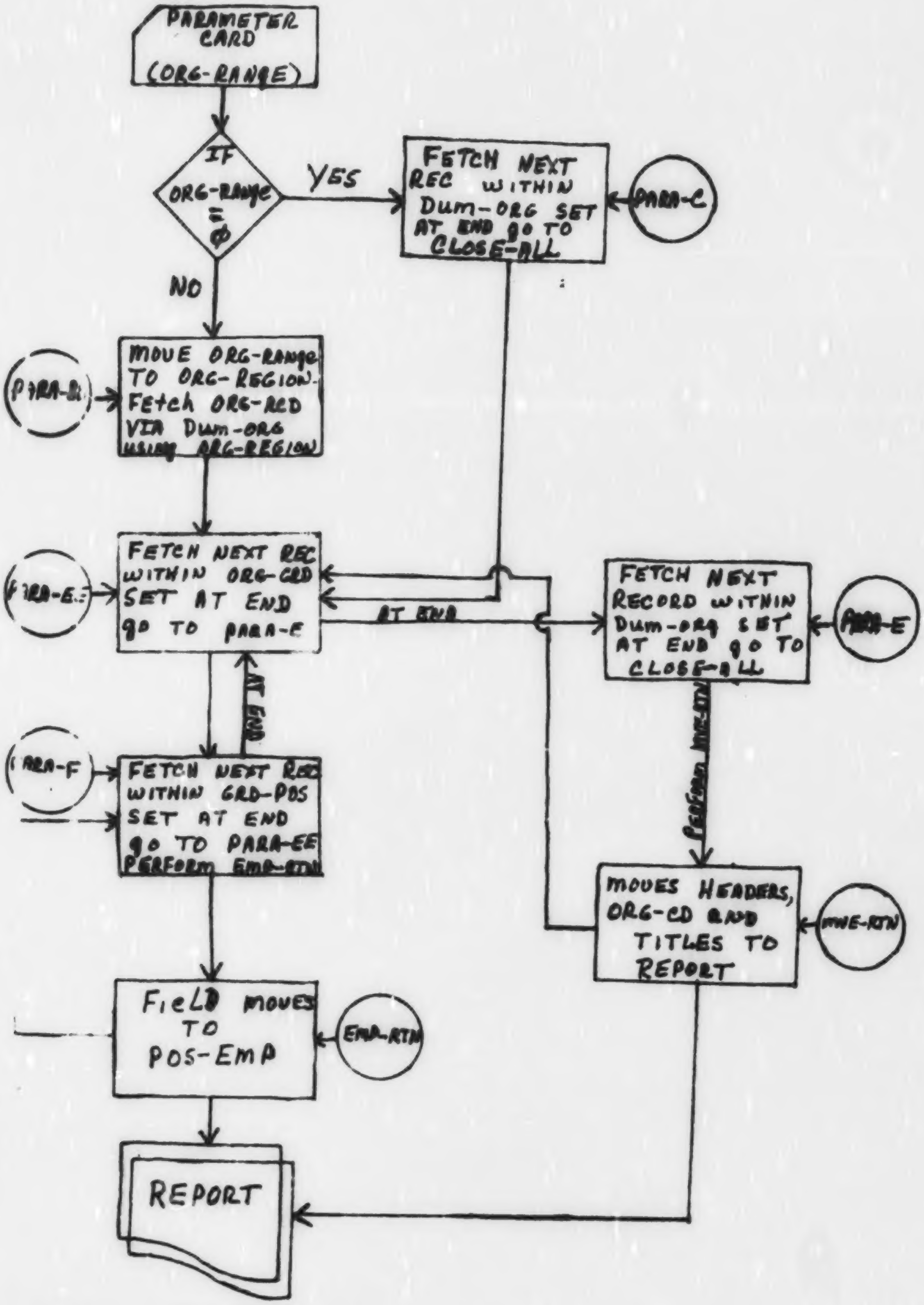
AREA NEEDED
POS
SPA-[illegible]
NTR
ON-[illegible]
POS-[illegible]
-- POS

DMS FLOW


Dummy
(6 WORDS)
SET
DUM-ORG
(POINTER ARRAY)
POS-PTR
ORG-GRD
GRD-POS
POS-EMP
(51 WORDS)
(MEMBER)
POS EMP
(51 WORDS)
(MEMBER)
POS-EMP
(51 WORDS)
(MEMBER)
2

Summary Report

COBOL PROGRAM FLOW


PARAMETER CARD (ORG-RANGE)
IF ORG-RANGE = 0
YES
NO
FETCH NEXT REC WITHIN Dum-ORG SET AT END go TO CLOSE-ALL
PARA-C
PARA-B
MOVE ORG-RANGE TO ORG-REGION. Fetch ORG-RCD VIA Dum-ORG USING ORG-REGION
PARA-E
FETCH NEXT REC WITHIN ORG-GRD SET AT END go TO PARA-E
AT END
FETCH NEXT RECORD WITHIN Dum-ORG SET AT END go TO CLOSE-ALL
PARA-E
AT END
PERFORM MVE-RTN
PARA-F
FETCH NEXT REC WITHIN GRD-POS SET AT END go TO PARA-EE PERFORM EMP-RTN
MOVES HEADERS, ORG-CD AND TITLES TO REPORT
MVE-RTN
FIELD MOVES TO POS-EMP
EMP-RTN
REPORT

Summary Program Statistics

This program (COBOL) uses the DUMMY record, which is the owner record of many sets. The sets this program uses are DUM-ORG, ORG-GRD and GRD-POS SETS. Once the owner record of a particular set is found, the program will go through the entire database, member by member, extracting all the needed info to produce a Summary Report of all regions, or a particular region depending on the parameter card.

Summary ECL Execution Runstream

```
UNIVAC*SMIT.DMS1100
        @RUN,R/R  16JES/0/0,22095DMS,UNIVAC,10,500
        @QUAL DMS
        @ASG,A  POS-INDEX.
        @ASG,A  POS-PTR.
        @ASG,A *SMIT.
        @ASG,A  *NCCPMIS.
        @USE  NCCPMIS.,*NCCPMIS.
        @ASG,A  *DMRST.
        @USE   DMRST.,*DMRST.
        @ASG,A  POS.
        @ASG,A  EPA-ORG-AREA.
        @ASG,A  ENTRY-LVL.
        @ASG,A   SON-AREA.
        @DMRST.ADMLP,ESZ   *SMIT.SUMMARY,TPF$.
        @NEWCOB,ERS   TPF$.DMLOUT,TPF$.
        @MAP,IS ,*SMIT.ABS
        IN  DMRST.LINKER
        IN TPF$.D$WORKSUMMAR
        IN DMRST.DMR
        IN DMRST.CLSEG$
        LIB LIB*3R1COB.
        IN TPF$.
        @XQT  *SMIT.ABS
```

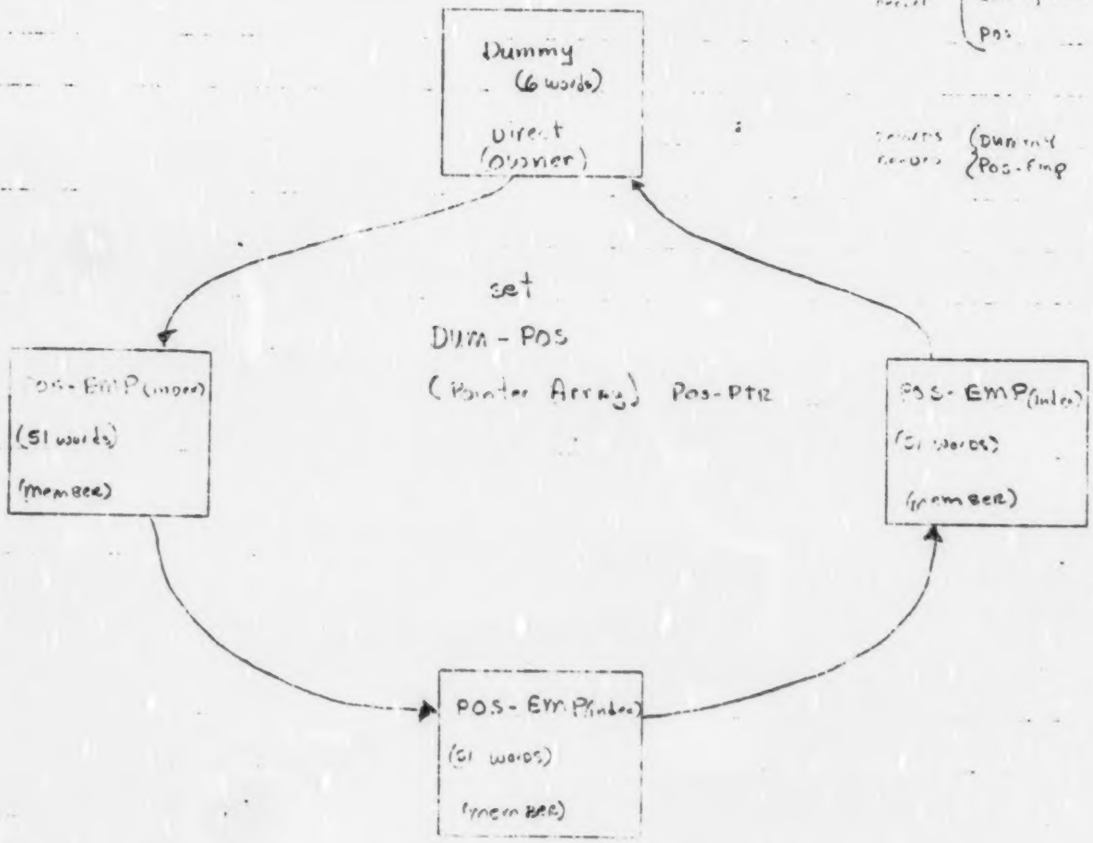
EEO/Female Employment Statistics
Report

Report : EEO/Female Employment Statistics

DMS1100 flow

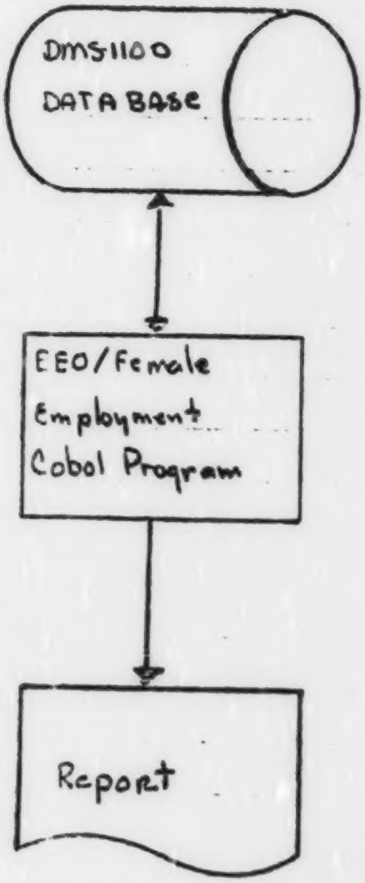
[illegible] {POS-PTR
Pos-Index
Entry-lvl
Pos

[illegible] {Dummy
Pos-Emp


Dummy
(6 words)
Direct
(Owner)
set
DUM-POS
(Pointer Array) Pos-PTR
POS-EMP (index)
(51 words)
(member)
POS-EMP (index)
(51 words)
(member)
POS-EMP (index)
(51 words)
(member)

eport: EEO/Female Employment Statistics

Cobol Program flow


DMS1100
DATA BASE
EEO/Female
Employment
Cobol Program
Report

Report: EEO/Female Employment Statistics

Program Summary

This DMS 1100 COBOL program uses the DUMMY record, which is the owner record of many sets. The particular set this program uses is the IUM-POS set. Once the owner record of the set is found, the program will go through the entire database, member by member, extracting all the needed information to produce the EEO/Female Employment Statistics report. Report information for previous years are blanked out since the data base does not contain this information at present.

Report: EEO/Female Employment Statistics

ECL Compiling Runstream

```
@RUN,R/R             16DMSC,2209SPMISM,DMS,10,999
@ASG,A               NCCPMIS.
@ASG,A               DMRMT.
@USE                 D.,DMRMT.
@ASG,A               PRG-FIL.
@USE                 Z.,PRG-FIL.
@D.ADMLP,L3          Z.PROG2,TPF$.PROG2/M,Z.PROG2
@ACOB,L              TPF$.PROG2/M,TPF$.PROG2/M
@PREP                TPF$.
@MAP,ILA             ,Z.PROG2/EEO-M
   IBANK,M           PGIB,01000
     IN              TPF$.PROG2/M
   DBANK,M           PGDB,0154000
     IN              D.LINKER
     IN              TPF$.D$WORKPROG02
     IN              D.CLSEGS
     IN              TPF$.PROG2/M
END
@FIN
```

Report: EEO/Female Employment Statistics

ECL Execution Runstream

```
@RUN,R/R              16DMS2,2209SPMISM,DMS,10,99
@DELETE,C             EEO- RPT.
@TIME
@ASG,UP               EEO-RPT.,F40
@USE                  OUT1.,EEO-RPT.
@ASG,A                NCCPMIS.
@ASG,A                POS-PTR.
@ASG,A                POS.
@ASG,A                POS-INDEX.
@ASG,A                ENTRY-LVL.
@ASG,A                PRG-FIL.
@XQT                  PRG-FIL.PROG2/EEO-M
@PMD,PEL
@FREE                 EEO-RPT.
@SYM,U                EEO-RPT.,,PR
@FIN
```

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ENVIRONMENTAL PROTECTION AGENCY
FEMALE EMPLOYMENT STATISTICS REPORT

REPORT DATE
07/07/77

GRADE OR SALARY	FULL-TIME EMPLOYEES 1977 TOTAL	WOMEN NUMBER	WOMEN PERCENT	FULL-TIME EMPLOYEES 1976 TOTAL	WOMEN NUMBER	WOMEN PERCENT	FULL-TIME EMPLOYEES 1975 TOTAL	WOMEN NUMBER	WOMEN PERCENT
GS-1	22	17	77.3						
2	102	80	78.4						
3	609	458	75.2						
4	1,053	780	74.1						
5	1,214	863	71.1						
6	558	483	86.6						
7	980	502	51.2						
8	158	100	63.3						
9	931	309	33.2						
10	44	4	9.1						
11	1,093	250	22.9						
12	1,385	177	12.8						
13	1,310	98	7.5						
14	871	47	5.4						
15	453	19	4.2						
16	92	1	1.1						
17	29	1	3.4						
18	5	0	0.0						
TOTAL GS	10,939	4,189	38.3						
OTHER THAN GS									
UP TO $6,999	749	237	31.6						
$7,000 TO $9,999	490	225	45.9						
$10,000 TO $13,999	236	24	10.2						
$14,000 TO $17,999	63	2	3.2						
$18,000 TO $25,999	1	0	0.0						
$26,000 TO $29,999	0	0	0.0						
$30,000 TO ABOVE	5	1	20.0						
TOTAL	12,493	4,679	37.6						
AVERAGE GRADE	9.1	6.2							

Average Grade by Organization Report

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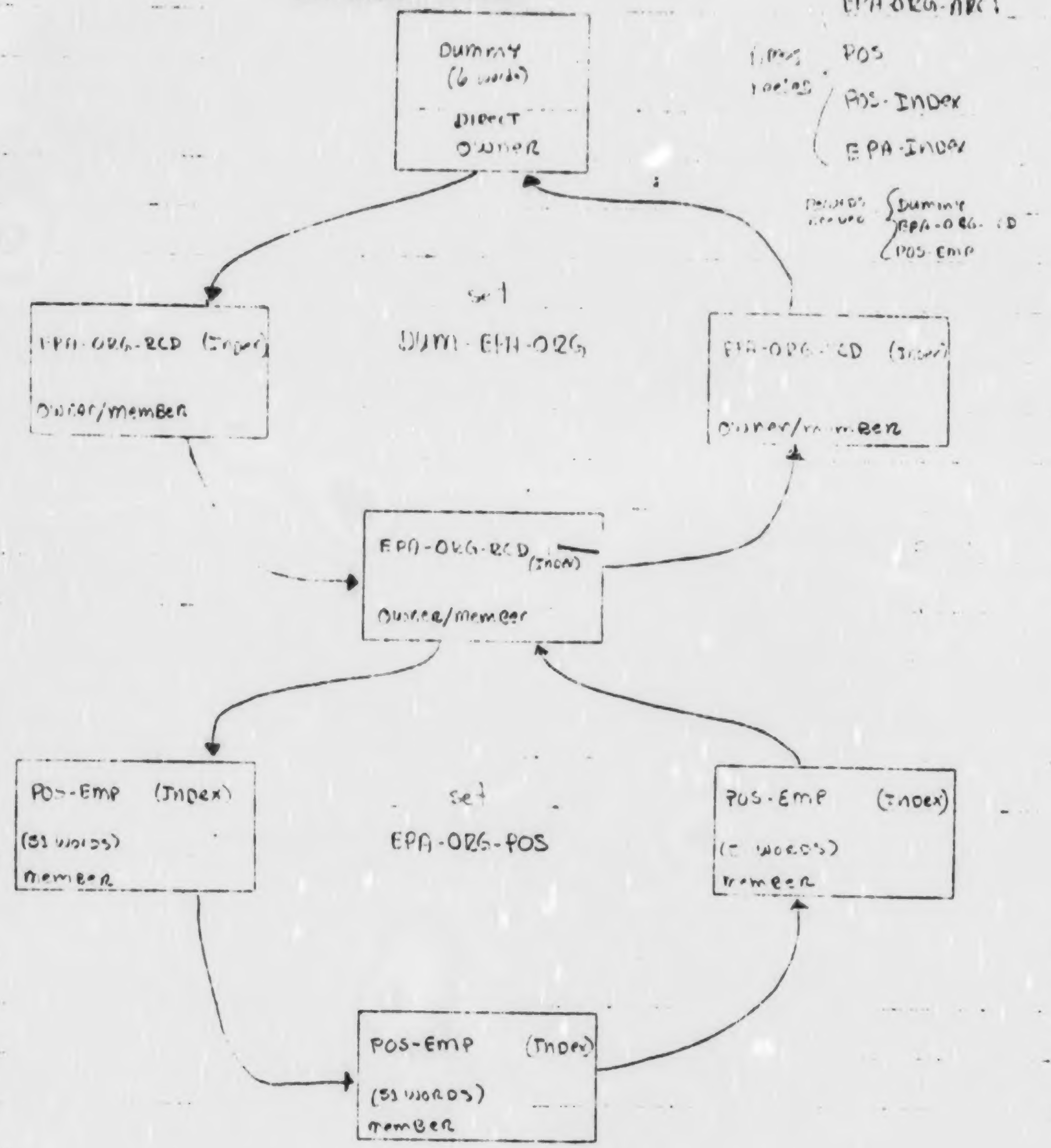
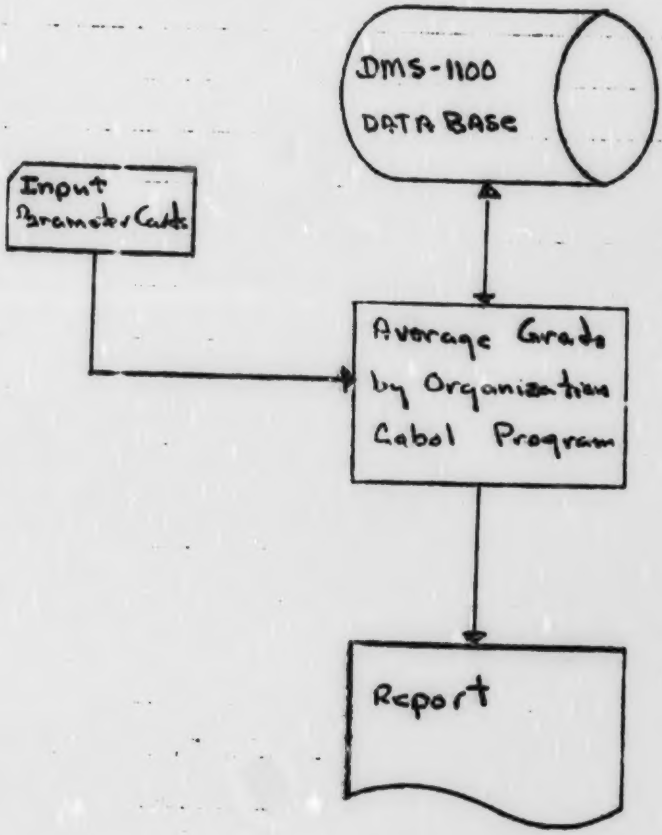
Report: Average Grade by Organization

DMS1100 flow


DUMMY
(6 words)
DIRECT
OWNER
set
DUM-EPA-ORG
EPA-ORG-RCD (Index)
Owner/member
EPA-ORG-RCD (Index)
Owner/member
EPA-ORG-RCD (Index)
Owner/member
set
EPA-ORG-POS
POS-EMP (Index)
(53 words)
member
POS-EMP (Index)
(53 words)
member
POS-EMP (Index)
(53 words)
member
EPA-ORG-AREA
AREAS
POS
POS-INDEX
EPA-INDEX
RECORDS
DUMMY
EPA-ORG-RCD
POS-EMP

port: Average Grade by Organization

Cobol Program Flow


DMS-1100
DATA BASE
Input
Parameter Cards
Average Grade
by Organization
Cobol Program
Report

Report: Average Grade By Organization

Program Summary

This DMS 1100 COBOL program uses the DUMMY record, which is the owner of many sets. The particular set this program uses is the DUM-EPA-ORG set. Once the owner record of this set is found, the program instructs DMS to return the next member record of the set, which is the organization record. This EPA-ORG-RCD record is also an owner of the EPA-ORG-POS set. After extracting all the needed information from the EPA-ORG-RCD record, the program will ask for the next member of the EPA-ORG-POS set. These members are the POS-EMP records. When all of the data is collected from each member record of the EPA-ORG-POS set, the program will ask for the next member record of the DUM-EPA-ORG set, which is the next EPA-ORG-RCD record. This is the program looping mechanism. The data collected is stored in a table by organization code. Data which is not kept on the data base is manually entered in the table through data cards. Over ceiling and committed totals for each region plus all unallocated totals would be manually entered. When the end of the database is reached data from the table is formatted into the report. Before the program terminates, it will display the total number of EPA-ORG-REC and POS-EMP records.

Report: Average Grade by Organization

Data Card Layout

Card 1: Over ceiling and committed by organization code

Column	Description
1-2	first two digits of organization code (group level)*
3-4	blank
5-8	number of over ceiling for organization (leading zeros)
9	blank
10-13	number of committed for organization (leading zeros)
14-80	Blank

* = for unallocated total value should be 24

Card 2: Unallocated Total

Column	Description
1-2	value of 25 (program knows this is for Unallocated total)
3-4	blank
5-8	within ceiling (leading zeros)
9	blank
10-13	positions filled (leading zeros)
14	blank

15-18	authorized (other than full-time permanent)
19	blank
20-23	positions filled (other than full-time permanent)
24-80	blank

These data cards should be placed in a file so an '@ADD' ECL card can add them to the runstream following the program execute card ('@XQT'). The program will know where to enter the data from the card into the table by using the numbers in column 1 & 2 of the data card.

Report: Average Grade by Organization

ECL Compiling Runstream

```
@RUN,R/R                16DMSC,22095PMISM,10,999
@ASG,A                  NCCPMIS.
@ASG,A                  DMRMT.
@USE                    D.,DMRMT.
@ASG,A                  PRG-FIL.
@USE                    Z.,PRG-FIL.
@D.ADMLP,LZ             Z.PROG1,TPF$.PROG1/M,Z.PROG
@ACOB,L                 TPF$.PROG1/M,TPF$.PROG1/M
@PREP                   TPF$.
@MAP,ILA                ,Z.PROG1/POSITION-M
   IBANK,M              PGIB,01000
     IN                 TPF$.PROG1/M
   DBANK,M              PGDB,0154000
     IN                 D.LINKER
     IN                 TPF$.D$WORKPROG01
     IN                 D.CLSEG$
     IN                 TPF$.PROG1/M
END
@FIN
```

Report: Average Grade by Organization

ECL Execution Runstream

```
@RUN,R/R             16DMS1,22095PMISM,DMS,10,99
@DELETE,C            POS-RPT.
@TIME
@ASG,UP              POS-RPT.,F40
@USE                 OUT1.,POS-RPT.
@ASG,A               NCCPMIS.
@ASG,A               EPA-ORG-AREA.
@ASG,A               ENTRY-LVL.
@ASG,A               POS.
@ASG,A               POS-INDEX.
@ASG,A               PRG-FIL.
@XQT                 PRG-FIL.PROG1/POSITION-M
@ADD,P               PRG-FIL.INCARD/POSITION
@PMD,PEL
@FREE                POS-RPT
@SYM,U               POS-RPT.,,PR
```

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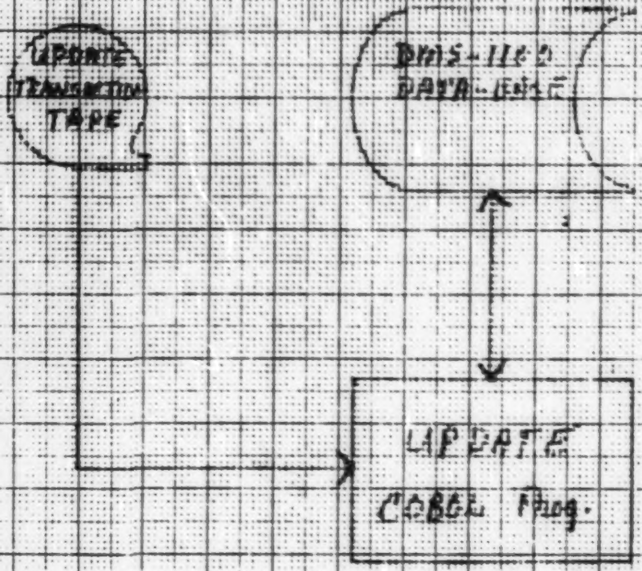
ENVIRONMENTAL PROTECTION AGENCY
POSITION SUMMARY

REPORT DATE
07/07/77

ORGANIZATION	FULL-TIME PERMANENT WITHIN CEIL	FULL-TIME PERMANENT OVER CEIL	FULL-TIME PERMANENT AUTHORIZED	FULL-TIME PERMANENT FILLED	FULL-TIME PERMANENT VACANT	FULL-TIME PERMANENT COMMITTED	OTHER THAN FULL-TIME PERMANENT AUTHORIZED	OTHER THAN FULL-TIME PERMANENT FILLED	OTHER THAN FULL-TIME PERMANENT VACANT	AVERAGE GRADE FOR GS POSITIONS
OFFICE OF THE ADMINISTRATOR	768	15	783	436	347	6	76	152	76-	10.33[illegible]
ASST ADMR FOR PLANNING & MANAGEMENT	3,149	45	3,194	1,225	1,969	7	438	282	156	9.2573
ASST ADMR FOR ENFORCEMENT	979	0	979	358	611	14	87	40	47	9.[illegible]
ASST ADMR FOR AIR & WASTE MANAGEMENT	2,926	25	2,951	957	1,994	8	295	154	141	9.[illegible]
ASST ADMR FOR WATER & HAZARDOUS MATL	3,320	95	3,415	1,161	2,254	11	155	195	40-	9.[illegible]
ASST ADMR FOR RESEARCH & DEVELOPMENT	5,561	65	5,626	2,196	3,430	21	314	547	233-	8.[illegible]
ASST ADMR FOR TOXIC SUBSTANCES	76	0	76	41	35	2	18	10	8	9.[illegible]
TOTAL (HEADQTRS & LABS)	16,826	248	17,074	6,434	10,640	69	1,436	1,463	27-	9.2[illegible]
REGION 1, BOSTON	672	9	681	356	325	4	86	22	64	8.59[illegible]
REGION 2, NEW YORK	960	11	971	521	450	6	108	31	77	9.[illegible]
REGION 3, PHILADELPHIA	1,010	34	1,044	523	521	5	102	13	89	8.[illegible]
REGION 4, ATLANTA	1,092	27	1,119	585	534	17	88	28	60	7.[illegible]
REGION 5, CHICAGO	1,246	8	1,254	666	638	3	132	24	108	8.[illegible]
REGION 6, DALLAS	754	8	762	390	372	2	76	40	36	8.[illegible]
REGION 7, KANSAS CITY	572	10	582	284	298	3	54	19	35	8.[illegible]
REGION 8, DENVER	572	20	592	297	295	1	54	36	18	9.[illegible]
REGION 9, SAN FRANCISCO	698	7	705	357	348	6	62	43	19	8.[illegible]
REGION 10, SEATTLE	542	10	552	278	274	0	70	43	27	9.[illegible]
TOTAL (REGIONAL)	8,118	144	8,262	4,257	4,055	47	832	299	533	8.[illegible]
UNALLOCATED TOTAL	113	0	113	0	113	0	33	0	33	
TOTAL (EPA-WIDE)	25,057	392	25,449	10,691	14,808	116	2,301	1,762	539	9.[illegible]

UPDATE PROGRAM
SUMMARY

DMS-1100 COBOL FLOW


UPDATE TRANSACTION TAPE
DMS-1100 DATA-BASE
UPDATE COBOL Prog.

Update Summary

The Update COBOL Program Summary

This DMS 1100 COBOL program uses the DUMMY record, which is the owner of many sets. Depending on what field(s) indicated in the update data record, the program will find a particular record using the keyed field, (Social Security Number) and update the field(s) of that record until a new social security number is encountered. The first field of an update transaction record determines whether the DMS-DATA RECORD is to be updated, deleted or stored as a new record. The second field is the key field (social security number). The third field tell this COBOL program what field on the DATA-BASE to update or modify for a particular record. The fourth field contains the update information. There is not a final report for this program.

AREAS NEEDED:

1. POS-INDEX
2. JOB-INDEX
3. ORG-INDEX
4. SUB-LEVEL
5. JOB-AREA
6. POS-PTR
7. POS
8. EPA-ORG-AREA
9. ENTRY-LVL
10. SON-AREA

UPDATED-TRANSACTION-FILE

Block Contains 32 records
Record contains 10 to 410 characters
Label record standard

Updated-rec-1 (deleted record)

Record position first	last	length	data item picture	date item name	description
1	1	1	X	First-Charac	2
2	10	9	X	Social Security Number	

Updated-rec-2 (change in any of the 106 fields)
(no updated-rec-2 is written if there is no change in any field)

Record position first	last	length	date item picture	data item name	description
1	1	1	X	First-Charac	3
2	10	9	X	Social Security Number	
11	13	3	9	Field-no*	The field-no that is to be changed.
14	48	35	X	Field-ch*	The new field

* Example: If field 3 (Organization Code) is changed
old-rec = 22084000
new-rec = 22095000

updated-rec-2 = 00322095000

UPDATED-TRANSACTION-FILE (continued)

Updated-rec-3 (addition of a new record)

Record position					
first	last	length	data item picture	data item name	description
1	1	1	X	First-Charac	1
2	10	9	X	Social Security Number	
11	11	1	X	Filler	
12	35	24	X	Employee Name	
36	36	1	X	Filler	
37	44	8	X	Organization Code	
45	47	3	X	Filler	
48	65	18	X	Position Title	
66	66	1	X	Filler	
67	70	4	X	Service Comp Date	
71	71	1	X	Filler	
72	72	1	X	Perm-Other Code	
73	73	1	X	Type Appointment Code	
74	75	2	X	Sort-Key	
76	77	2	X	Pay Plan	
78	78	1	X	Filler	
79	80	2	X	Grade Level	
81	81	1	X	Zero	
82	83	2	X	Step	
84	84	1	X	Filler	
85	88	4	X	Occupation (Class)	
89	97	9	X	Account #1	
98	106	9	X	Geographic Location Code	
107	107	1	X	Filler	
108	112	5	X	Salary	
113	113	1	X	Filler	
114	117	4	X	CSC Sub Office	
118	119	2	X	Filler	
120	125	6	X	Date of Birth (Year, Month, Day)	
126	126	1	X	Filler	
127	127	1	X	Sex Code	
128	128	1	X	Shift Code	
129	129	1	X	Retired Status	
130	135	6	9	Monthly Annuity (converted from packed decimal.	
136	137	2	X	Payroll Separation Code	
138	143	6	X	Date Last Equiv. Increase (Year, Month, Day)	
144	149	6	X	Limit Expiration Date (Year, Month, Day)	
150	151	2	X	Day Limitation	
152	153	2	X	Fixed Hours #1	

Updated-rec-3 (continued)

Record position first	last	length	date item picture	date item name	description
154	162	9	X	Fixed Account #2	
163	164	2	X	Fixed Hours #2	
165	173	9	X	Fixed Account #3	
174	175	2	X	Fixed Hours #3	
176	184	9	X	Leave Account	
185	191	7	X	Position Number	
192	192	1	X	Position Tenure	
193	193	1	X	Position Occupied Code	
194	194	1	X	Position Category Code	
195	195	1	X	Supervisory/Non Code	
196	198	3	X	Nature Action CD #1	
199	199	1	X	Action Shred Out Code #1	
200	202	3	X	Nature Action CD #2	
203	203	1	X	Action Shred Out Code #2	
204	206	3	X	Nature Action CD #3	
207	207	1	X	Action Shred Out Code #3	
208	210	3	X	Nature Action Code #4	
211	211	1	X	Action Shred Out Code #4	
212	213	2	X	Additions to Nature Action Term #1	
214	215	2	X	Additions to Nature Action Term #2	
216	221	6	X	Effective Date of Action (Year, Month, Day)	
222	222	1	X	Veteran Preference Code	
223	223	1	X	Special Employment Code	
224	227	4	X	Designated Agent	
228	233	6	X	EOD Bureau (Year, Month, Day)	
234	239	6	X	Date Last Promotion (Year, Month, Day)	
240	245	6	X	Date Service Toward Career (Year, Month, Day)	
246	246	1	X	Sep Code	
247	248	2	X	Tenure Group	
249	249	1	X	Work Schedule	
250	250	1	X	Summer Empl Exam Code	
251	251	1	X	Count/Not Count Code	
252	256	5	X	OPG Code	
257	265	9	X	Location Abbreviation	
266	267	2	X	Shortage Category Code	
268	268	1	X	Saved Rate Code	
269	270	2	X	Functional Category Code	
271	272	2	X	Handicap Code	

Updated-rec-3 (continued)

Record position first	last	length	date item picture	date item name	description
273	273	1	X	Citizenship	
274	274	1	X	Employment Obligation	
275	275	1	X	Retirement System	
276	281	6	9	Dollar Limitation (converted from packed decimal)	
282	287	6	9	Hour Limitation (converted from packed decimal)	
288	292	5	X	Zip Code	
293	293	1	X	Position Sensitivity	
294	297	4	X	File Location	
298	303	6	X	Employment Office Location	
304	304	1	X	Performance Rating	
305	306	2	X	Reason for Resignation (Quit)	
307	312	6	X	Date Probation Period Begins (Year, Month, Day)	
313	318	6	X	SCD (RIF) (Year, Month, Day)	
319	320	2	X	Special Program Identification	
321	322	2	X	Education Level	
323	326	4	X	Academic Field	
327	328	2	X	Year of Highest Degree	
329	363	35	X	Employee Street Address	
364	381	18	X	Employee City and State	
382	398	17	X	Filler	
399	404	6	9	Position Number	
405	410	6	X	Date Created	

Program Listing

A. Program 1.

The following runstream created the program file EPAPERS-1.

```
@RUN,R/R       13R,22095SDM,SDM
@ASG,CP        EPAPERS-1.
@NEWCOB,RISE   EPAPERS-1.PRG,TPF$.REL
@MAP           ,EPAPERS-1.PRG
   IN TPF$.REL
   LIB LIB*3R1COB.
@FIN
```

To create the tape conversion use the following runstream inserting changes were applicable (such as run-id, account number, project-id, etc.)

```
@RUN,R/R       13R/65,22095SDM,SDM,30
@ASG,A         EPAPERS-1.
@ASG,TJ        INTAPE.,16N,B-----        (EBCDIC tape)
@USE           A.,INTAPE.
@ASG,T/W       OUTAPE.,16N,reel #/reel #
@USE           B.,OUTAPE.
@MOVE          A.,1
@SORTF         15000,105/W
@XQT           EPAPERS-1.PRG
@FIN
```

B. Program 2.

The following runstream created the program file EPAPERS-2.

```
@RUN,R/R        13R,22095SDM,SDM
@ASG,CP         EPAPERS-2.
@NEWCOB,RISE    EPAPERS-2.PRG.TPF$.REL
@MAP            ,EPAPERS-2.PRG
   IN TPF$.REL
   LIB LIB*3R1COB.
@FIN
```

To create the transaction file use the following runstream inserting changes where applicable (such as run-id, account number, project-id, etc.)

```
  @RUN/R/R        13R/65/3,22095SDM,SDM,90
  @ASG,A          EPAPERS-2.

* @NEWCOB,RSE     EPAPERS-2.PRG,TPF$.REL
* @MAP            ,EPAPERS-2.PRG
     IN TPF$.REL
     LIB LIB*3R1COB.

  @ASG,TJ         O-TAPE.,16N,B-----           (basic EBCDIC tape)
  @USE            OLD-TAPE.,O-TAPE.
  @ASG,TJ         N-TAPE.,16N,B-----           (update EBCDIC tape)
  @USE            NEW-TAPE.,N-TAPE.
  @MOVE           OLD-TAPE.,1
  @MOVE           NEW-TAPE.,1
  @ASG,T          TEMP.,F40/1/POS/80
  @SORTF          18000,105/W
  @ASG,T/W        UPDATE-TAPE.,16N,reel #/reel #
  @XQT            EPAPERS-2.PRG
  @FIN
```

* As documented previously each update will require compiling and mapping after changing data-item named "PN-CTR" with the last position number.

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COMPUTER SYSTEMS

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V.5. NCC STABILITY IMPACT STATEMENT

INTERCOMMUNICATION

TO Samuel C. Brown

FROM (NAME & EXT.) S. E. Knudsen

LOCATION & DATE June 1, 1977

DEPARTMENT & M.S.

CARBONS J. Adam
D. Worley
M. Steinacher
D. Fulford

SUBJECT DMS-1100 Stability Impact Report

Per your request and the priliminary DMS-1100 PMIS implementation plan; the following is a report, indicating what stability impacts one might expect when installing and using DMS-1100. The format of this report is one of first, including other 1100 sites experiences; second, local NCC testing; and third, some conclusions with discussable recommendations.

I. Other 1100 Sites

Three 1100 sites using DMS-1100 were contacted or visited at the on-set of the PMIS model project (see attached visitation report). Follow-up conversations have been made to some of the sites. In all cases, 1100 os stability was not a problem using DMS-1100. In fact, no site could attribute any 1100 system crash to the use of DMS-1100.

DMS-1100/user stability was a somewhat different story. DMS-1100 is a complex data-management system. Users should never have it in a free wheeling environment. Users and operators may have a major impact on other DMS-1100 users, the data-base, and can cause "strange things" to occur. In most cases, where no major, centralized control was placed on the use of the DMS-1100, and people lacked an understanding of what was going on; the implementation of DMS-1100 was a painful experience.

II. Local Testing Results

During the weeks of May 16 through May 27, 16 hours of block time on the NCC 1100/42 was devoted to the installation and testing of the generated DMS-1100 and QLP (Query Language Processor). The first week was spent checking out the DMS-1100 library routines with very little background work. During the second week, QLP and DMS-1100 programs were run in a system load environment. QLP and DMS-1100 were executed with background work including FIREUP programs, on-line PTS (on-line hardware testing), SORT's, and miscellaneous demand activity.

At the end of this test period, no system crash (system hang or zero stop) occurred during test time that could be attributed to a DMS-1100 program. It must be noted that any new application program could exercise a new path in the 1100 os and cause a system crash. The application we tested with, however, was a typical application.

We did encounter some user instability. There were two occurrances where the DMS-1100 runs were hung up. All other types of processing continued. In these instances, all DMS-1100 runs had to be aborted, and the data base reinitialized in order to allow DMS-1100 to function. A reboot was not required. Although these types of problems do not cause system reboots, they are impacts on DMS-1100 users.

Research will continue as to what circumstances surround such problems. The goal will be to either resolve or define what events cause DMS-1100 problems and to make this part of the final documentation.

III. Conclusions/Recommendations

Barring any unforeseen problems, DMS-1100 should not cause a system crash. It is recommended that final testing per your desires be completed prior to its incorporation into the production system.

Current plans call for standard testing of a new boot-tape on June 18; put the tape into production on June 22 not using DMS-1100; and start using it on Saturday, June 25. On June 25, Univac will put several DMS-1100 programs to the test. Single thread versions of DMS-1100 will be used on the project in the mean time.

The areas of user stability will have to be addressed incrementally. I suggest an operators seminar by June 7 prior to its use in NCC production. This will make them familiar with the required interaction for DMS-1100 and develop other added procedures.

Of course the initial application use of DMS-1100 will be the project model. It will have to be a rule that DMS-1100 is not a available to the general user community. DMS-1100 applications require prior research before experimentation. After any DMS-1100 application goes into production; any future changes, development, new schemas, or whatever, must be done on test data-bases, under single-thread versions of DMS-1100. All experimentation and research should be kept divorced of active, usable, DMS-1100 libraries and data-base.

In summary, DMS-1100 is ready for incorporation at NCC. EPA should not expect any major stability problems. However; the need for good operator instruction and data-base administration comes up again and again. Sites that have not had this, and had people not knowing what they were doing, had major problems. NCC is on the right path to prevent this.

S. E. Knudsen

VI.

NCC DATA BASE USERS GUIDE

VI. NCC DATA BASE USERS GUIDE

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NCC DATA BASE USERS GUIDE

ENVIRONMENTAL PROTECTION AGENCY
NATIONAL COMPUTER CENTER

Preliminary Draft

DATA BASE USERS GUIDE

This preliminary Users Guide is a working paper which NCC may find useful in drafting its own Users Guide. In many cases, presumptions have been made as to NCC's existing data processing environment, as well as suggestions as to how NCC might approach various functional requirements. Many topics, by their very nature are left blank, as only NCC will be in a position to "fill in those blanks."

VI

1. INTRODUCTION

1.1. Purpose

The NCC Data Base Users Guide is designed to establish the framework for the initiation, development and operation of NCC projects which use data base management software. In addition, technical and administrative policies, standards and procedures are included to assist NCC personnel responsible for data base projects.

1.2. Scope

This Guide contains information relating to data base processing on the NCC UNIVAC system. Other functions not directly related to data base processing may be found in (NCC must specify other documents).

It is not the intent of the Guide to replace or alter any technical information contained in reference material supplied by the vendor.

1.3. Updates/Revisions

The NCC Data Base Users Guide is expected to undergo many revisions throughout its lifespan. As data base technology changes and new concepts emerge, updates will be provided to all subscribers by (to be determined staff).

1.4. Distribution

The NCC Data Base Users Guide and all attachments will be distributed to all personnel directly involved in the data base environment by (to be determined staff). They will also be responsible for distributing those attachments of the Guide they deem necessary to the other components of NCC.

1.5. Development

(To be determined staff) has the ultimate responsibility for the development of the Guide. They will solicit help from those areas associated with data base oriented processing in order to arrive at a consensus of agreement on material which appears in this Guide.

2. DATA BASE DEVELOPMENT

2.1. General

The initiation, development, and operation phases of data base applications require greater coordination between applications development and the various components of the NCC organizational structure than is the case with other types of application development. This Guide attempts to define those entities which might be involved in that process, what their functions are, and how the coordination might be accomplished.

2.2. Data Base Functions

Within the initiation, development, and operational phases of an NCC data base project, there will exist a number data base functions which will require a cooperative effort among systems and operations as well as applications development, the user community and NCC management.

Administration for the overall NCC data base environment migh include the following functions:

A. Determine which projects should participate in the data base environment and control the overall environment.

B. Determine the data base content with respect to which data elements are to be included in the data base and resolve conflicts of who owns the data.

C. Establish data in an NCC Data Dictionary/Directory using standards which NCC must establish.

D. Define data relationships.

E. Control who may access the data, who may change the data, and determine what security requirements must be met.

F. Provide technical support on conceptual design of the system, data base design, and application program implementation.

Administration relating to specific applications within the data base environment will include the following:

G. Creation and maintenance of both the logical and physical file design.

H. Determination and acquisition of the data base storage media.

I. Development and implementation of the data base application, providing testing facilities and procedures, and insuring the procedures are adhered to.

Data Base Operations will include the following functions:

A. Maintenance and technical support of the data base software and utilities.

B. Daily systems operation of the data base software.

C. Initiation of restart and recovery procedures in the event of a system failure.

D. Monitor the overall system performance and utilization of both application and data base activity.

The areas of responsibility for these various functions will be determined and defined by that organization which NCC must establish for overall control purposes.

2.3. Data Base System Development

2.3.1. General

Systems for which NCC is responsible, evolve in phases from the time that an idea occurs to create the software through the time that the software produces the required output. The development of all projects follows an orderly progression. The project is first initiated by the user, then developed by the applications programming and finally made operational.

2.3.2. Initiation Phase

In general, all projects for which NCC is responsible, will have to be approved. This approval process may involve the submission of a service request by the initiator, accompanied by a functional description of what needs to be done. The project, if approved, will then enter the development phase.

2.3.3. Development Phase

The development phase of any project, whether it be a data base project or not, is where the functional description, as received from the user, is analyzed to determine the requirements for the

the software that is required to do the job. Once these requirements are known, the software is then defined, specified, programmed, and tested. It is within this phase that the determination of a data base approach would be determined.

In an attempt to provide for a common understanding, the developmental phase for a project can be further defined into four major steps: definition, design, programming, and testing. These steps are the normal progression for the development of any data base project.

2.3.3.1. Definition

The definition step of a project within the developmental phase is the point at which the software requirements are determined in order to satisfy the user's needs.

The software requirements would be documented into a functional requirements specification which contains the initial definition of the software (whether it is to be data base oriented or not), the operating environment and the development plan. During the preparation of the initial definition of the software, the data requirements are also identified. Some of initial factors that the analyst will use in making this determination are defined in the potential data base project evaluation.

If it is determined that the project may be a potential data base application, the data base staff will review the functional requirements specifications to validate the initial findings.

At this point in the development phase of a project, the data requirements should be identified and defined for inclusion in the NCC Data Dictionary/Directory.

2.3.3.2. Design

The design step of a project within the developmental phase is the point that the system design specification are produced This specification contains, in addition to the entire system design, the program specifications and the data base specifications.

The data base specifications will be prepared by the data base staff, (must be defined by NCC) using guidelines specified in the DMS-1100 data base design specifications. The data base staff will then produce the logical file design. This logical design will be reviewed as it applies to the overall system design for the project and other existing file designs to determine its feasibility and impact on the entire data base environment.

2.3.3.3. Programming

The programming step within the developmental phase is the point that the software is coded and debugged. The physical file design as produced by the data base staff may be concurrent with the programming effort. Additional data base load programs may need to be developed if the data does not currently exist on the data base. During the program development, a test plan will also be produced. All programs will adhere to NCC data base programming/testing conventions

2.3.3.4. Test

The test step of a project within the developmental phase is the point that the software is tested to insure that the programs are bug free and together they produce the user requirements they were developed for and are ready for implementation.

During the testing step in a stand alone environment, the programs will be tested first to guard against possible data base contamination or destruction. The data base staff will certify the test results before the system is released for implementation.

2.3.4. Operation Phase

The project after being implemented will be turned over to operations. Included in an operations manual, will be the data base project operation procedure which will be used to maintain the daily operation of data base management system.

2.4. Data Base Organizational Responsibilities

2.4.1. General

The data base functions associated with the implementation, development, and operational phases of a data base project must be defined by NCC.

Within this environment, all data base technical and administrative policies, standards, and procedures must be established and enforced.

NCC may find it convenient to distribute the data base functions within the NCC organizational components due to existing operational environment.

2.4.2. NCC Design Review Committee

The NCC design review committee will insure that central NCC systems are designed and implemented in a manner which will meet user requirements by the most efficient use of NCC resources. The committee will review the design and implementation plans of all systems at critical design points and all systems intended ultimately to be placed in a regular production status. The committee will also review major exiting on-going systems to determine whether redesign and/or programming of all or part of the system would be desirable and beneficial.

2.4.3. Other Areas of Responsibility (to be defined)

Coordinating the development and operation of all data base projects for NCC and its users is mandatory. This coordination includes assisting users in taking the greatest advantage of common features of independent systems, and in avoiding pitfalls which might increase the cost of their systems or adversely affect the total operations environment

Major participation of the data base staff in the development of data base systems include:

A. Coordinate definition and adherence of data base standards.

B. Determine whether a system lends itself to the data base apporach.

C. Produce the design specifications, access frequencies, response times and data base volumes.

D. Assist in the development and review of file designs and data structures to be utilized as necessary to maintain the reliability and integrity of the overall set of NCC data bases.

E. Provide technical assistance to programming in the identification of logical structures of files, records and elements.

F. Review system test of new systems and systems undergoing major revisions and coordinate the development of universally accepted testing conventions as to their impact on the overall set of NCC files and data base(s).

G. Monitor all critical design and operational points of system implementation with regards to the data base design.

H. Coordinate and oversee implementation and operation of all data base system software.

I. Maintain the NCC Master Data Dictionary, assuring identification of data elements of the systems being developed. Resolve access deadlocks and minimizes data redundancy. redundancy.

J. Assure data privacy and integrity from unauthorized users.

K. Coordinate preparation of test data bases, run units and documentation.

L. Maintain all run unit program files, (source, relocatables and absolutes) and back-up to all data bases.

M. Recommend types and levels of training required on all aspects of data base systems.

N. Review the selection of additional hardware as required by a particular data base project.

O. Establish and maintain standards for the documentation of data base systems.

P. Review standards for data base system development as to their effects on existing and future systems.

Q. Maintenance of the data base software. This includes receiving new or revised software from the vendor, evaluating the benefits, recommending its use, and implementing and testing all such data base software.

R. Provide technical liaison on use and results of system tests and publishing technical papers on such subjects as known problems, programming notes/tips.

S. Generating the data base software and documenting all system generation parameters.

T. Develop data base utility software for general use.

U. Develop operational manuals adequate for operations to recognize and routinely respond to data base messages.

V. Provide operational support of data base software which includes recovery and backup procedures.

W. Establish data base system development standards as necessary to maintain overall computer system efficiency and reliability and overall NCC data base reliability and integrity.

X. Recommend individuals for attendance in data base training courses.

2 4.4. Application Programming

Application programming has responsibility for the successful development and operation of all data base projects. It is here that the functional description, as received from the user, is defined, specified, programmed, tested and made operational.

It is for convenience, that I have broken application programming out, to better indicate some functional activities which should be included:

Typical Activities might include:

A. Being an NCC representative to the user on aspects of the system being developed.

B. Determine the software requirements to satisfy the users' needs, within constraints (to be determined).

C. Produce the program specifications, in conjunction with the responsibilities associated with systems design and data base specifications.

D. Code and debug the application programs.

E. Test the programs to insure that they are bug free and produce the desired results and notify the appropriate data base staff people.

F. From time-to-time, new user requirements will institute need for changes to existing systems. Application programming would be involved in this maintenance function.

G. Produce documentation as required by NCC.

2.5. Data Base Organizational Relationships

The foregoing sections have attempted to define what the major data base functions are. The framework of how data base systems are developed, and the basic organizational responsibilities of who does what.

As was indicated earlier, development of data base systems within NCC may be a very complex procedure and the need for very good coordination and communication will be mandatory in order to be responsive to users' needs.

3. DMS 1100 TECHNICAL PROCEDURES

3.1. Enhancement In Current Release Of DMS-6A.

Level 6 of DMS-1100 contains the following enchancements to DMS software:

A. Indexed Pointer Array Sets.

B. 'Acquire' Pointer Array Command.

C. Randential (Random Sequential) - Supplied Calc Routine.

D. Optional Record Name On Various Commands.

E. Optional Use Of The Record Delivery Area.

F. Record Level Currency Locks.

G. On Line Dump.

H. Checkpoint Extensions.

I. Long Recovery Extensions.

J. Compacted After Looks, Changed Record Indicator And Recovery I/O Overlap.

K. DMR As Multiple Common Banks.

L. Improved Deadlock Detection.

M. Delayed Audit Trail Assign And Console Keyins To Free And Swap.

3.2. Outstanding Problems In 6A

3.2.1. Data Definition (DDL)

3.2.2. Data Manipulation Language (DML)

3.2.3. Data Management Rountines (DMR)

3.2.4. Data Management Utility (DMU)

3.3. Technical Restrictions/Considerations

3.4. DMS 1100 Data Base Design Notes

3.5. DMS 1100 PROGRAMMING TECHNICAL NOTES

A. When using the ASCII COBOL compiler, if the 'IMPART' and 'ROLLBACK' paragraph are in a subprogram, the rollback paragraph must be defined as an 'Entry' point. If the rollback paragraph attempts to continue processing it must do so by issuing an 'EXIT'. This returns control to the instruction following the command during which rollback occurred.

B. The rollback paragraph, 'AT END' paragraphs and 'ERROR' paragraphs must not be overlayable segments.

C. If subprograms do not issue an 'IMPART', the main COBOL program which does the 'IMPART' must declare a 'RUN-UNIT-ID' in the schema section.

D. The 'CLOSE' command destroys the currency indicators of the area's closed, as well as any record or set currencies where the current record is located in any of the closed area's.

E. Exact binary usage (PIC 1 (M) is not implemented in level 6A DDL. Data character symbol 1 may be used in the 'PICTURE' clause of Database-Identifiers.

F. No DML command should be included in the rollback paragraph in the DML program. The DMR has, in effect, performed a 'DEPART WITH ROLLBACK' on the run unit before giving control to the rollback paragraph. If a DML command other than 'IMPART' is then issued, control will be given to the 'ERROR' paragraph with an error status of 21.

G. Under certain conditions the following appear as undefined references from linker: C$SL9X, C$S35X, and C$S35Y. These messages do not indicate an error condition and may be ignored.

H. When using generalized commands in a subprogram which does not issue an 'IMPART' the generalized names must be defined in the 'IMPART' program. They must appear in the subprograms 'COMMON WORKING or LINKAGE' in the same order as they were defined in the 'IMPART' program.

I. Error Codes 07 and 13.

1. An error code of 07 is returned to the run unit if some kind of sequential processing is being done, i.e, finding the next of a record in a given area/set/index sequential or calc chain, while an error code of 13 means that no record exists which satisfies the criteria specified.

2. Specifically, an error code of 07 is returned to the run unit if the DMR encounters the end of an area/set/index sequential or calc chain, and the area or set is not empty, as in the following examples:

    (A) 'Find/Fetch' 3 or 4 with the 'Next, Prior, or Data Name' Options.

    (B) 'Find/Fetch' format 7.

    (C) 'Find/Fetch' format 5 with the 'Next Duplicate' option.

3. An error code of 13 is returned if the set occurrence or area specified above is empty (i.e., the set has no members, or the area contains no records).

4. An error code of 13 is returned to the run unit if no appropriate record or set occurrence exists which satisfies the specified criteria. The 'Specified Criteria' depends on the type of command issued.

(A) 'Find/Fetch' Format 1 - Area name and area-key or a database-key.

(B) 'Find/Fetch' Format 5 - Depends on location mode of record:
(1) Direct - Area-name and area-key.
(2) Calc - Specified calc key.
(3) Via Set - All keys required by appropriate set occurrence selection clause.

(C) 'Find/Fetch' Format 6 - Allkeys required by appropriate set occurrence selection clause.

(D) 'Store' - All keys required by the set occurrence. Selection clause of all sets into which the record is to be inserted.

J. For the dynamic assignment of files, these four conventions apply:

1. All filenames used by DMS must be unique among the set filenames assigned to runs using DMS.

2. All DMS files, whether assigned externally or internally to the DMR, must be assigned with the universal qualifier.

3. Database Areas (Files) which use keys (i.e., Read/Write) will have to remove such keys during the time that such areas are in use with a multi-thread DMR. This requirement is necessary due to the method by which DMR writes pages back to the database. In all cases dynamic assignment by the DMR will not provide the required keys if they , in fact, exist for a particular area. Thus, such files must be assigned by the user with the proper keys (as in singlethread mode).

4. Note: Dynamic assign of a fixed pack file that is rolled out will result in a DMR error and program rollback. Therefore, it is recommended that the user assign files of this type in order to avoid possible program termination and delay.

K. 'B' is the only editing symbol which may be used in a picture clause. However, in some cases an occurrence of another editing symbol in a picture clause is not flagged in error. In these cases storage allocation by the DDL translator may not agree with storage allocation by the COBOL compiler.

L. If a 'SET OCCURRENCE SELECTION' clause specifies 'LOCATION MODE OF OWNER' and an 'ALIAS' is specified for any identifier in the 'LOCATION MODE' clause of the owner record, then the path report will list for the location mode of the owner record only those identifiers for which aliases are specified.

M. The minimum length of a variable length record is not included in the schema report.

N. 'CALC' or 'SORT' key which is a group item and contains the first variable length item in the record is not itself detected to be a variable length item and hence to be in error.

O. The DDL does not check whether an area, which is specified in the 'WITHIN' clause for a record with location mode 'DMSCALC' (the System Calc Procedure), has specified interspersed overflow pages. Note: 'DMSCALC' does not allow for such interspersed overflow usage.

P. The DDL does not check for an area being the object of 'WITHIN' clauses in both calc and index sequential entries.

Q. The DDL does not check whether the area entries for all areas in which a CALC'd record may be stored have identical 'CALC' clauses.

R. An attempt to store a record whose location mode is via set where a calc record is the owner of the set may result in faulty placement if the member record has no 'WITHIN' clause. The calc owner's 'WITHIN' clause may not be followed in the correct order.

S. When an area specified on a 'WITHIN' clause is checked for available space during via set placement logic and 01 error is returned if that area is closed. This error should not be returned if additional 'WITHIN' clauses remain to be checked.

T. In level 5A the DMR forced serial execution of all CALC routines. This restriction is removed in Level 6. Consequently if used by more than one activity, the user CALC routine must be a reentrant module.

U. 'TIMER' performs an absolute assign of the audit trail tape. Sites must not disable absolute assigns via 'QUOTA'.

V. When an 'ASCII COBOL' record has an 'OCCURS DEPENDING ON ITEM', the item which determines the size of the variable length item must be of the same mode, (ASCII or FIELDATA), as the variable length item. Inconsistent results and incompatibility problems with future releases of DMS 1100 result if the items are of different modes.

W. If the DMR is configured to control multiple schemas (i.e., SYSGEN codes 'ONESCH = OFF' and 'SCLLEN = OR > 2') then the 'AREA CONTROL' clause of each of the schemas must be the same. An attempt to 'IMPART' a schema with an 'AREA CONTROL' clause different from that of a schema already 'IMPART'ed will result in a '31' rollback error status.

X. A possible problem occurred during qualification testing of 6A concerning a 'FETCH Format 5' of a record with 'CALC' location mode. The return address in the 'CALC' packet may be improper.

Y. When reviewing application program source listings for error notations, keep the following in mind:

- COBOL error messages follow the line in error.
- DML error messages preceed the line in error.

3.6. DMS 1100 DMU TECHNICAL NOTES.

A. 'SET VERIFY':

1. If an error is found during the execution of the command, it is terminated and the next command is retrieved.

2. If a loop is detected and ASCII COBOL was used to generate the utility processor, the source of a loop will not be found.

3. ASCII does not allow an 'ER MCORE$' which is used by set verify in determining the source of a loop in a set occurrence.

4. Sets whose mode is pointer array cannot be verified.

B. 'SET/CALC VERIFY' - A maximum of 100 characters of a sort or calc key may be printed.

C. 'UP/DOWN' - These commands may not be used with multithread DMR if the utility processor is mapped under level 27 of the Exec. A contingency will occur if they are used.

). 'UP/DOWN/RECOVER' - An 'II RUN-ID' console keyin to the utility processor must not be done while executing these commands since internal DMR indicators may be set which cannot be cleared after the keyin.

E. 'INITIALIZE' - This command cannot be used following a 'DOWN' command for the same area.

G. 'LONG RECOVERY' - After executing long recovery the area will be in the same condition (i.e., UP or DOWN) as the time when the data base dump was taken. An 'UP ALL' command may be needed after long recovery.

H. A DMU command which is not followed by a period does not function at all. In addition, the DMU does not produce an error diagnostic for this situation.

3.7. SYSGEN Parameters In Current Release.

3.7.1. Description Of Selected Parameters:

DMS 1100 manuals on occasion make reference to certain system generation parameters when discussing various DMR functions. These references require the system user to be knowledgeable regarding specific values associated with some of the parameters. The following list is composed of parameters most important to system users, including a brief discussion of the function of each.

NOTE: All values not specifically noted as octal can be assumed to be DECIMAL

A. MAXREC - Maximum number of member records in a set occurrence. Used by DMU 'SET/CALC VERIFY' to detect a loop condition (i.e., bad SET or CALC POINTERS). Present value of this parameter is 1,000.

B. AUTORP - This feature is present in M/T DMR. Allows automatic recovery points to be placed on an audit trail tape based on the 'RECOVERY POINTS' clause in the SCHEMA definition.

C. NUMBIL - Controls the maximum number of areas without preinitialized pages that can be simultaneously opened for initial load. Present values of this parameter is 10.

D. LRINUM - The maximum number of records in the users schema having an 'INTERVAL CLAUSE'. Present value of this parameter is 10.

E. LDPAGE - Generates DMR coding that uses the last page number found having available space as the base point for a search for space. This parameter has been set to generate the required DMR code.

F. NUMBRU - The maximum number of run units allowed in the DMR system concurrently. Present value of this parameter is 5.

G. SCLLEN - Controls the length of the Schema Reference Table i.e. the number of schemas that can be 'INVOKED' in DMR concurrently. Present value of this parameter is 5.

H. ARLLEN - Controls the length of the Area Reference Table list. This list consists of a two word header and one word entry for each area. In addition this parameter controls the maximum number of area allowed. Present value of this parameter is 64.

I. RRLLEN - Controls the length of the Record Reference Table list. This list consists of a two word header and one word entry for each record type. This parameter also controls the maximum number of record types allowed. Present value of this parameter is 128 (decimal).

J. SRLLEN - Controls the length of the Set Reference Table list. This list consists of a two word header and one word entry for each set type. This parameter also controls the maximum number of sets allowed. Present value of this parameter is 150.

K. BUTLEN - Controls the length of the Block Usage Table. This parameter controls the number of pages which may be in core storage simultaneously assuming space exists in the buffer area. The number of page entries for the block usage table is currently set at 150.

L. TABLEN - This parameter controls the size of the Dynamic Table Buffer. The DTB area accepts RECORD/SET description tables and SET/RECORD/AREA/SCHEMA reference tables. Present value of this parameter is 2,000 (words).

M. PAGLEN - This parameter controls the size of the DMR Dynamic Page Area. The DPA is allocated to contain entire physical pages transferring between mass storage and DMR. In addition, quick look pages are processed through this area. Present value is 6,000 (words).

N. DWNMAX - Controls the maximum number of area that can be 'DOWNED' simultaneously by the 'DATA MANAGEMENT UTILITY PROCESSOR' (DMU). Present value is 15.

O. KDMR - This parameter generates code necessary to hold the DMR in core even if there are no data base run units active in the system. At present, this parameter does allow DMR to remain in core regardless of activity.

P. DIRECT - Generates DMR code to handle 'STORE DIRECT' functions. At present this feature is allowed.

Q. CALC - Generates DMR code to handle 'STORE CALC' functions. At present this feature is allowed.

R. VIASET - Generates DMR code to handle 'STORE VIA SET' functions. At present this feature is allowed.

S. PASETS - Generates DMR code to handle 'POINTER ARRAY SET MODE' functions. At present this feature is allowed.

T. INDSEQ - Generates DMR code to handle 'INDEX SEQUENTIAL LOCATION MODE' functions. At present this feature is allowed.

U. GENCOM - Generates DMR code to handle 'GENERALIZED COMMAND' processing. At present this feature is allowed.

V. ERRDMP - Generates DMR code to handle dynamic dumps of the DMR buffer and D$WORD depending on a list of user specified error codes. At present this feature is allowed.

W. SDP - Generates DMR code to handle page search for space as follows: When overlow is full, the pages immediately following the original CALC'ed to page are searched for available space. At present this feature is allowed.

X. STAT - Generates DMR code to collect and print statistics when instructed to do so by the DMU Processor. At present this feature is allowed.

Y. DMSQUAL - A twelve character name to be used as the DMS Universal Qualifier. This is the name used as the qualifier for all files dynamically assigned by the DMR. All files needed by the DMR and assigned by the run unit must have this qualifier. Present value of this parameter is: '---------DMS' (- EQ. BLANK).

Z. TIP -- Turns on code within DMR if TIP File Control is to be used for TIP files. TIP is off.

AA. CDBAPT -- Turns on code in the DMR common data bank to capture all abnormal program termination conditions. 'CDBAPT' is on.

BB. QDLR -- For QUEUING/DEADLOCK resolution. If 'QDLR = 0' the number of altered pages is used to determine which run is to be activated or rolled back. If 'QDLR = 1' the user priority scheme is used to determine which run unit is to be activated or rolled back. QDLR is set to 0.

CC. ATT -- Set to 1 if an audit trail tape is present. Code in DMR dealing with the audit trail tape is conditionally generated based on this parameter.

DD. CDB -- This parameter, if set to 1 (ON), indicates that the DMR is being used as a write enabled common data bank (CDB). CDB is set to 1 (ON).

EE. RANDEN -- This switch is on if the code for the system CALC routine 'RANDENTIAL' is to be included in the DMR. RANDEN is set to 0 (OFF).

FF. SPA -- This switch is on if the code for indexed pointer arrays is to be included in the DMR. SPA is set to 0 (OFF).

GG. DDECTT -- This parameter controls the generation of the (NEW) connection matrix logic to be employed to detect deadlock. DDECTT is set to 1 (ON).

HH. DDRSOL -- Set on if the new deadlock resolution logic is to be employed by the DMR, DDRSOL is set to 1 (ON).

II. CKPT6 -- Controls the generation of logic to handle the (NEW) dynamic checkpoint feature. If off, all checkpoints are taken when no run units are active. CKPT6 is set to 0 (OFF).

JJ. COMPAL -- Controls generation of DMR logic that provides AFTER LOOK's of only records actually changed. If the parameter is off AFTER LOOK's include the entire page. COMPAL is set to 0 (OFF).

KK. DYNDUMPID -- This parameter is set to a 6 character name which must be used as the project-id of the run executing the utility program 'DYNDUMP'. DYNDUMID = 'DYNDUM'.

3.8. DMS 1100 Database Design Technical Notes

3.8.1. Introduction

This section will contain material relating to system analysis, and DBA functions involved in utilizing Univac DMS-1100 Database software. In some cases the information will apply to a specific release of DMS. However the bulk of material within this section will apply to DMS in general and therefore will be carried forward in each subsequent technical release bulleting to avoid reference and updating problems.

3.8.2. DMS 1100 Schema Changes.

3.8.2.1. General

The question of data independence is directly related to the question of flexibility of database design. That is, how quickly does a data administrator become 'LOCKED INTO' his database design? What can he or can he not change and what are its implications? This can occur at two distinct (although related) levels: 1. The physical (DATABASE) level, 2. The logical (PROGRAM) level. The physical level involves the database itself and the physical structure of the records, pointers, and areas. The fundamental question here is: under what conditions must the database (or areas within it) be dumped and reloaded? Not included in this discussion are dump and reload considerations for 'GARBAGE COLLECTION', because too many records have been forced into overflow, etc. This discussion looks at dump and reload considerations required as a result of changes in the SCHEMA and not as a result of degradation of the database over time.

The logical level involves changes to the application programs (RUN UNITS) which access the database. Thus, at this level the impact of changes to the SCHEMA go beyond the database administrator's dump and reload problem and require the application programmers to make corresponding logic changes to the run units. This has the potential of having much more serious impact than dumping and reloading the database, particularly if the coding changes are non-trivial and, therefore, the application programs must be re-debugged.

3.8.2.2. Database Changes.

For purposes of this discussion, the impact of changes in the schema is discussed at both the physical and logical levels and, within each level, three categories are considered. At the database level, these are:

1. No reorganization

2. Reorganize all interrelated areas.

3. Reorganize entire database.

Reorganization refers to the process or performing a physical (record-by-record) dump of the data under the current schema and then performing a record-by-record load under a new schema.

If no reorganization is required, then the SCHEMA changes made do not require any physical alteration of the database. If the SCHEMA changes require a change to the data (either user or system), then the involved record type or types must be reorganized. Because the reorganization causes new Database-Keys to be assigned, all areas which contain other record types, logically related through set definitions to the records being organized, must in turn be reorganized. NOTE: This statement is true with one exception -- owner records related through set definitions to member records being reorganized, need not themselves be unloaded and reloaded, although pointers within the owner records will be altered due to unloading and reloading the member records. The general rule that should be remembered is that all interrelated areas must be reorganized. There are also certain SCHEMA changes which require reorganization of the entire database. If all areas are interrelated, then the previous situation in effect requires reorganization of the entire database.

.8.2.3. Run Unit Changes.

With respect to the impact of schema changes upon the logic of the application programs (run units). There are again 3 categories"

1. No change.
2. Recompilation only.
3. Change run unit.

No change means that an object run unit, which was compiled and ran with the old version of the SCHEMA, also runs with the new. A recompilation is required if the SCHEMA changes have altered information used by the DML preprocessor, itself, or included with the object run unit for use by the DMR. Change to the run unit (and recompilation) is required if the SCHEMA changes directly affect the portion of the schema used by the run unit. If a run unit requires change, then that change may be a mechanical one requiring simple syntax changes or additions, or it may be a change to the logic of the run unit. The latter is a serious matter as it requires sufficient knowledge of the program to make the change and then a retesting effort. However, this distinction between mechanical and logical changes is subjective at best and, therefore, no attempt is made to make that distinction in this discussion.

Note also that changes to the run unit are only required if that run unit makes direct reference to the AREA/RECORD/SET involved.

NOTE: Changing levels of DMS 1100 may require DML program re-compilation and/or re-mapping, therefore users should maintain permanent source and relocatable libraries to facilitate this procedure.

.8.2.4. CHANGE TABLE

(1) No change.

(2) Recompilation only.

(3) Change run unit.

	D.B.			R.U		
	1	2	3	1	2	3
Change the name of the schema	X					X
Change the 'LOOKS' clause	X			X		
Change the number of possible areas			X	X		
Change the 'RECOVERY POINTS' clause	X			X		
Change the 'CHECKPOINT' clause	X			X		
Change the name of an existing area	X					X
Add a new area	X			X		
Change the area code		X			X	
Expand the 'ALLOCATE' clause to maximum	X			X		
Expand the 'ALLOCATE' clause beyond maximum		X		X		
Add 'PREINITIALIZED' option to 'ALLOCATE' clause	X			X		
Change combination of data & overflow pages	X			X		
Decrease the page size		X		X		

	D.B. 1	D.B. 2	D.B. 3	R.U 1	R.U 2	R.U 3
Increase the page size		X		X		
Increase the page size using 'EXPAND'	X			X		
Change the 'LOAD' factor	X			X		
Change the number of calc chains		X		X		
Change the name of an existing record	X					X
Add a new record	X			X		
Change a record code		X			X	
Change the 'LOCATION MODE'		X				X
Change the 'DIRECT' data-names	X					X
Change the calc procedure		X		X		
Change calc keys or index seq. keys		X				X
Change in 'IN' clause	X					X
Change to 'DUPLICATES ARE ALLOWED'	X			X		
Change to 'DUPLICATES ARE NOT ALLOWED'		X		X		

	D.B.			R.U.		
	1	2	3	1	2	3
Change 'VIA' to a different set	X					X
Change the 'INTERVAL'		X		X		
Add new areas on 'WITHIN'	X					X
'RESERVE' more/less pointers		X		X		
Add new items		X			X	
Rearrange/Restructure items		X			X	
Switch from 'OCCURS' to a set		X				X
Change the name of an existing set	X					X
Add a new set (to new records)	X				X	
Add a new set (to existing records)		X				X
Change set mode (chain to pointer array)		X			X	
Add/Remove 'PRIOR' option from 'MODE IS CHAIN'	X				X	
Switch unsorted 'ORDER' ('FIRST, NEXT, PRIOR')		X			X	
SWT. unsorted 'ORDER' ('FIRST, NEXT, PRIOR') to 'LAST'	X			X		
Switch from sorted to unsorted 'ORDER'		X		X		

	D.B.			R.U		
	1	2	3	1	2	3
Add/Remove Sorted 'RECORD NAME'		X				X
Change owner record type		X				X
Change member record type		X				X
Add/Remove member record types		X				X
Switch from 'AUTOMATIC' to 'MANUAL'		X			X	
Switch from 'MANUAL' to 'AUTOMATIC'		X				X
Add/Remove 'LINKED TO OWNER' option		X		X		
Switch 'ASCENDING/DESCENDING' option		X		X		
Add/Remove 'RECORD NAME' option		X				X
Add/Remove all but last key		X				X
Add another key as last key		X				X
Remove last key	X			X		
Switch 'FIRST/LAST DUPLICATES' option		X		X		
Switch from duplicates to no duplicates		X		X		
Switch from no duplicates to duplicates	X			X		

	D.B.			R.U		
	1	2	3	1	2	3
Switch from 'SOS CURRENT' to 'LOCATION'	X					X
Switch from 'SOS LOCATION' to 'CURRENT'	X					X
Switch from 'SOS' Format-1 to Format-2	X			X		
Switch from 'SOS' Format-2 to Format-1	X			X		
Changing the 'USING' identifiers	X					X
Change the 'ALIAS' identifiers	X					X
Add new data-names to schema*					X	

* If care is taken, so that new data names alphabetically follow existing data names. Recompilation is not necessary.

3.8.3 Using More Than One Schema Against the Same D.B.

3.8.3.1. General

In some cases it may be desirable to use different schemas against the same database for different purposes. The most common case is to use one schema for initial load of a database and another schema for subsequent accessing. By pre-sorting input and editing out any unwanted duplicates, the user can make initial load quicker and cheaper by eliminating the overhead associated with DMR performance of sorting and duplicate checking.

It is also theoretically possible to replace one schema used for database access with another schema used for database access, without re-loading the database. However, even if the physical structure of the database is not changed, the data loaded under the old schema may not meet the logical needs of programs operating under the new schema. Therefore, great care must be taken with such changes.

Any change to the schema which indicates a change in the physical structure of the database will require reloading some or all of the database. Therefore, two schemas which reflect different physical structures CANNOT be used against the same database.

In order to help the user to evaluate the impact of possible changes to a schema, the 'DDL' clauses are divided below into three groups: those which directly affect the physical structure of the database - those which are related both to the physical structure of the database and to programs accessing the database - and those related only to the logical view of the database seen by 'DML' programs.

Any changes to entries in the first list will require re-loading part or all of the database. Any changes to entries in the second list 'MAY' require re-loading the database. The user is advised to consult with NCC's Data Base Support Group before attempting to change any of the entries in the second list without re-loading the database. The entries in the third list may be changed without re-loading the database PROVIDED the logical organization of the data already loaded continues to meet the logical needs of the application. Note that a change to the 'AREA LOOKS' or 'LOOKS' clauses may require the taking of a database dump before the database is protected by long recovery.

Legend:

[A,B,C] A source specification does not require a component in this position, but can include either A, B, or C.

(A,B,C) Parentheses used in place of braces - a source specification must include exactly one of the components A, B, or C.

....Repeated choices may be made and included in a source specification, one after the other.

\A,B,C\ A source specification must include one of A, B, or C, but can include up to one of each.

" " Comment within - should never appear in syntax.

3.8.4. Physical Structure Considerations

1. AREA CONTROL IS integer-1 AREAS.

2. AREA NAME IS area-name-1;

   AREA CODE IS integer-1;

   [MODE IS (DATA/INDEX/POINTER) AREA;]

   [AREA MAPS TO TIP FILE;]

3. PAGES ARE integer-5 WORDS

4. [;CALC USES integer-8 CHAINS [LINKED PRIOR]].

5. RECORD NAME IS record-name-1;

   RECORD CODE IS integer-1;

6. LOCATION MODE IS (CALC/INDEX SEQUENTIAL...)

   "But not DIRECT or VIA set-name-1 SET"

7. USING data-base-identifier-1, [,data-base-identifier-2]...

   "Used with LOCATION MODE IS CALC"

8. USING (ASCENDING/DESCENDING) [RANGE] KEY

   data-base-identifier-3 [data-base-identifier-4]...

   INDEX AREA IS area-name-1

```
    [LINKS ARE NEXT [AND PRIOR]]

    [INTERVAL IS integer-2 PAGES]

    "used with LOCATION MODE IS INDEX SEQUENTIAL"

9.  [INTERVAL IS integer-3 PAGES]

        "used with LOCATION MODE IS VIA SET"

10. RESERVE integer-6 POINTERS

11. RECORD MODE IS (FIELDATA/ASCII)

12. SET NAME IS set-name-1;

    SET CODE IS integer-1

    MODE IS (CHAIN [LINKED PRIOR]/POINTER ARRAY

    POINTER AREA IS area-name-1)

    ORDER IS LAST

     "but not FIRST,NEXT,PRIOR,SORTED"

    OWNER IS record-name-1

13. MEMBER IS record-name-2 (AUTOMATIC/MANUAL)

     [LINKED TO OWNER]
```

3.8.4.1. Mixed Structure Considerations

1. TIP FILE CODE IS integer-0.

2. ALLOCATE integer-2 [PRE-INITIALIZED] PAGES

    [.integer-10 OVERFLOW PAGES AT END]

    [.integer-3 OVERFLOW PAGES EVERY integer-4 DATA PAGES]

    [.EXPANDABLE TO integer-11 PAGES]

3. Data-base-procedure-name-1

    "used with LOCATION MODE IS CALC"

4. (WITHIN area-name-2 [(integer-4/data-base-data-
    name-4) (THRU/THROUGH) (integer-5/data-base-data-
    name-5)])...

5. [(;(PIC/PICTURE) IS character-string-1/
    ;["item description"...](]

3.8.4.2 Logical Structure Considerations

1. SCHEMA NAME IS schema-name.

2. [AREA LOOKS INCLUDE (\\QUICK-BEFORE-LOOKS/

    BEFORE-LOOKS/AFTER-LOOKS/NO-LOOKS\\)]

    [RECOVERY-POINTS ARE EVERY integer-2 BLOCKS.]

3. [:LOOKS INCLUDE (\\QUICK-BEFORE-LOOKS/
BEFORE-LOOKS/AFTER-LOOKS/NO-LOOKS\\)]

4. LOCATION MODE IS (DIRECT/VIA set-name-1 SET)

"unless interval clause is specified"

"but not CALC or INDEX SEQUENTIAL"

5. Data-base-data-name-1. data-base-data-name-2

"used with LOCATION MODE IS DIRECT"

6. IN data-base-data-name-3

DUPLICATES ARE [NOT] ALLOWED

"used with LOCATION MODE IS CALC"

7. DUPLICATES ARE [NOT] ALLOWED

"used with LOCATION MODE IS INDEX SEQUENTIAL"

8. ORDER IS (FIRST/NEXT/PRIOR/SORTED [WITHIN
RECORD-NAME/BY DATABASE-KEY]);

"but not ORDER IS LAST"

9. [((ASCENDING/DESCENDING) [RANGE] KEY IS
(\\RECORD-NAME/data-base-identifier-1/
data-base-identifier-2]...\\)...

DUPLICATES ARE (FIRST/LAST/NOT ALLOWED)]

10. SET OCCURRENCE SELECTION clause.

3.8.5 General Design Notes.

A. Two extra pages are needed in an index area for index sequential records due to internal administrative work.

B. The length of a group item having an 'OCCURS DEPENDING ON' clause and a sub-item with 'LOCK' usage must be a multiple of whole words.

C. The maximum number of index levels that may be created on initial load of index sequential records is 30.

D. The DMR allocates space for variable length items by words. So extra characters may be allocated to fill out to word boundaries. In addition, the DDL sets up the starting address for each item in the record based on the maximum occurs value for each variable item in the record. So if an item follows a variable length item which does not have its maximum value and if the item is defined to start in character 3, then 2 extra characters will be allocated at the start of the word. If the value of the variable length item is 0, the DMR allocates 1 word.

E. In this release, a pointer area may not be the object of more than one set where 'MODE IS POINTER ARRAY'.

F. A record with a location mode of via set but having no 'WITHIN' clause is stored in such a way as to honor the within clause of the owner record of the set. This owner record itself may have no 'WITHIN' clause and honor the 'WITHIN' clause of its owner. The DMR handles this situation correctly if set occurrence selection is through 'LOCATION MODE OF OWNER'. If set occurrence selection is 'CURRENT OF SET' a problem exists.

When a 'VIA SET' record has no 'WITHIN' clause and the set selection is through 'CURRENT OF SET', the DMR takes the current of set 'DBK' and uses the 'DBKS' area code to start its search. It will always start with the first page of that area.

If the above does not produce desired results, the use of a 'WITHIN' clause on the 'VIA SET' record is suggested. This will cause the DMR to insert the 'VIA SET' record on the page of the logical insert point, if possible, or on an alternate page determined by the DMR.

The above situation will occur when:

1. The DMR is searching the prime path for the logical insert point.

2. This search takes the DMR up the hierarchy to a point where a record is described as a 'VIA SET' record whose set selection is through 'CURRENT OF SET'. Call this record 'REC-A'.

3. 'REC-A' has no within clause.

4. All records below 'REC-A', on the prime path, and including the record being stored, have no within clauses.

C. The syntactical constraints pertaining to the 'SET OCCURRENCE SELECTION' clause, of the 'Schema Definition Manual', should read as follows:

1. All data base identifiers must refer to declared items of the owner record of the set(s) referenced. All data base names refer to '77' or '01' level entries. The declaration of '01' level data-names must precede those of all other '01' level entries.

2. A 'USING' clause may qualify the 'LOCATION MODE OF OWNER' clause only when the 'LOCATION MODE' clause in the record entry for the owner record of the set in which this clause appears is 'VIA set-name SET'.

3. An 'ALIAS' clause may qualify the 'LOCATION MODE OF OWNER' clause regardless of the 'LOCATION MODE' clause in the record entry for the owner record of the set in which this clause appears.

(A) If the location mode is 'DIRECT' the data names being substituted for must refer to data base data names specified on the 'LOCATION MODE IS DIRECT' clause.

(B) If the location mode is 'CALC', the data base name being substituted for (if specified) must be the data base data name specified on the 'IN' clause. The data base identifiers being substituted for (if specified) must be the data base identifiers specified on the 'USING' clause and a substitution must be made for each. The data base identifiers being substituted for must be defined as elementary items in the record entry and their subroutines must be '77' level entries in working storage.

(C) If the location mode is 'INDEX SEQUENTIAL', the data base identifiers being substituted for must be the data base identifiers specified in the 'USING' clause and a substitution must be made for each. The data base identifiers being substituted for must be items specified in the location mode clause and their substitutions must be '77' level entries in working storage.

(D) If the location mode is 'VIA set-name SET', the data base data names must be '77' level entries in working storage and the data base identifiers specified must refer to:

(1) Data items specified in the 'USING' clause of a 'SET OCCURRENCE SELECTION' clause for another set with the same defined owner record type or.....

(2) Items specified for the owner record.

4. Set-name-2, set-name-3, must form a continuous path. Where the owner of set-name-3 is a member of set-name-2......with set-name-2 as a start point or root. The same set name cannot appear more than once. The last set named must be the subject of the set entry of which this clause is a part.

5. If the 'LOCATION MODE OF OWNER' option is used, the record entry for the owner record type being referenced must have a 'DUPLICATES NOT ALLOWED' clause if its location mode is calc or index sequential.

H. A potential problem exists for record types with location mode of index sequential or records which participate in indexed pointer array sets. If one or more of the key items (either index sequential location mode keys, or sort keys for an 'IPA' set) is a group item. The group item will not be broken down internally by the DMR into elementary components. If the elementary items are mixed 'ASCII' and 'FIELDATA' modes the possibility exists for unused bits to separate contiguous items. The state of these bits is not guaranteed and future references to such record occurrences may fail.

WARNING The situation described above may result in incompatibilities with future releases of DMS 1100.

I. Using two or more schemas concurrently is a supported DMS configuration. At least one site experienced unresolved difficulties with this mode against level 5 DMR. The problems appeared as deadlocks while one schema was imparting and another was departing simultaneously. Other sites have run with multi-schemas and experienced no such problems. Note that all concurrent schemas must have identical area control clauses, i.e., the number of bits used for area codes in the several schemas must be the same. Also the area names of all schemas as well as area, record and set codes must be unique.

3.9. Sample Run Streams

3.9.1. DDL Processor

The following is a sample run stream for compiling a SCHEMA.

```
1.  @RUN  "RUN ID","Account-No.",DMS,XX,XXX

2.  @ASG.CP "Schema-Name."

3.  @DDL.BLIR "Symbolic-Input-Element","Schema-Name".SCHEMA

       .

       .

      Source Schema

       .

4.  @FIN
```

Explanation

1. Standard EXEC 'RUN' Statement.

2. Schema-name must be the name of the file where the object schema is to be placed.

3. Symbolic-input-element is the "Filename.Element" of the element that is input to the 'DDL' processor. Schema-name must be the the same filename specified in statement 2. A detailed explanation of the 'DDL' control card can be found in the 'DMS 1100 Schema Definition' reference manual, Appendix C.

4. Standard Executive 'FIN' statement.

3.9.2. Executing the 'ADMLP/ACOB' Processors.

The following is a sample run stream for compiling a 'DML' COBOL program to produce a relocatable element.

```
 1.  @RUN  "RUN-ID","Account-No.",DMS,XX,XXX

 2.  @ASG,A "Schema-Name."

 3.  @ADMLP,EOZ "LIB-1.Source-ELT-1","LIB-1.Source-ELT-2"

 4.  @ACOB,RSE "LIB-2.Source-ELT-2","LIB-3.RELO-ELT-1"

 5.  @MAP,I  ,"LIB-4.ABSO-ELT-1"

 6.    IN F2.LINKER

 7.    IN "LIB-2".D$WORKXXXXXX

 8.    IN "LIB-3"."RELO-ELT-1"

 9.  @XQT  "LIB-4"."ABSO-ELT-1"

10.  @FIN
```

Explanation

2. "Schema-name" must be the name of a catalogued file containing an element named "SCHEMA". "Schema-Name" must be the same as the schema name specified on the "INVOKE SCHEMA" statement in "LIB-1". "Source-ELT-1".

6. File F2 contains the reentrant processor (REP) version of linker. You may be requested while testing to use the single-thread version, as follows:

   ```
   IN F1.LINKER
   ```

7. "XXXXXX" are the first six characters of the "PROGRAM-ID" specified within "LIB-1".Source-ELT-1". Note that "LIB-2" is the name of the library into which the output element from the 'DML' processor was placed.

Miscellaneous

1. Other options, such as standard 'SIR' options may be used on the control statements. A single library or 'TPF$' may be used.
2. The first six characters of the "RUN-UNIT-ID" specified in "LIB-1". Source-ELT-1" will be used to identify the program in all DMS messages to the operator.

3.9.3. Interfacing DMU With A Schema.

The following is a sample run stream for interfacing the DMU processor with a schema. This run stream should be rerun after a DMS system generation or when the schema ia changed.

```
1.  @RUN "RUNID","Account-No",DMS,XX,XXX

2.  @ASG,A "Schema-Name"
```

```
3.  @FREE TPF$

4.  @ASG,T TPF$.

5.  @ASG,A F2.

6.  @ASG,A F6.

7.  @ADMLP,BZS F6.MAIN-ASCII,TPF$.COB

8.  -10,11

9.         INVOKE SCHEMA "Schema Name" COPYING ALL

10.           RUN-UNIT-ID IS "RUN-ID"

11.  @ACOB,B TPF$.COB,TPF$.MAIN

12.  @PREP TPF$.

13.  @PREP F6.

14.  @MAP F6.UTMAPMT."Schema Name" .DMU

15.  @PACK "Schema Name".

16.  @FIN.
```

Explanation

2. Schema-name must be the name of the schema to be used with DMU.

9. Schema-name must be same name as specified in statement 2 above.

10. RUN-ID must be the RUN-ID specified on the @RUN control statement of the run which executes the DMU processor for this schema.

14. 15. Schema-name must be same name specified in statement 2 above. This @MAP statement places the DMU absolute element into the user's schema file and names the absolute element "DMU".

3.9.4 Executing A DMU Program

The following is a sample run stream for executing a DMU program.

```
1.  @RUN "RUN-ID, "Account-No.",DMS,XX,XXX

2.  @"Schema-Name".DMU,I

        .

        .

        DMU Source Commands (Period Mandatory)
                            (Will Not Function Without)

        .

        .

3.  @FIN
```

Explanation

1. RUN-ID must be same as RUN-ID specified in Statement 10 of the run stream for interfacing DMU with a schema.
2. Schema-name must be the name of the schema file where the absolute element DMU was placed. (See statement 14 of run stream interfacing DMU with a schema).
3. Standard Executive 'FIN' statement.

3.10. Additional Software Available To Users

4. APPENDIX A

4.1. Potential DMS 1100 Project Evaluation Guide

5. APPENDIX B

5.1. DMS 1100 Data Base Design Guide

6. APPENDIX C

6.1. DMS 1100 Programming/Testing Convention

7. APPENDIX D

7.1. DMS 1100 Project Operations Guide

8. APPENDIX E

8.1. DMS 1100 Operator's Guide

9. APPENDIX F

9.1. DMS 1100 End-User Guide

10. APPENDIX G

10.1 DBMS Training